AUG 13 1934

Engineering News-Record

25 Cents, $5 per year. McGraw-Hill Publishing Company, Inc.

August 9, 1934

Well Points Dry Seaside Trench
For Fort Monroe Seawall Construction

Data on the Structural Use of Plywood
From Two New Test Series

Subaqueous Steel Pipe Line
Lowered from Pipe Pontoons

Engineering Analysis of Five-Year Plans
For Russian Rehabilitation
[First of Three Articles]

Progress in the Conservation and Control
Of Artesian Water Supplies

An Engineering Survey of
the Central Drought Area

Laying a 42-in. pipe line across the St. Joseph River for Fort Wayne, Ind., water supply by utilizing pipe pontoons to support line during assembly and while lowering into a prepared trench.

SPECIFY MATHEWS

BECAUSE OF THESE 3 PARTS

No other hydrant so fully assures fire protection, for no other hydrant is built like the Mathews. Its barrel, containing all working parts, passes through a loose protection-case and screws tightly into the elbow. This means easy inspection or repair, complete elimination of frost upheaval, and no reason ever to dig or break pavements—even when traffic accidents smash it below ground.

Ask for free estimate of protecting your town with Mathews Hydrants.

"SAND-SPUN" PIPE

"Sand-Spun" pipe is Cast Iron – a superior pipe with an individual sand mould for every pipe.

Obtainable in 16½ ft. and 20 ft. lengths. These longer lengths save 30% to 60% in jointing materials and handling, as compared to 12 ft. lengths.

R.D.WOOD CO.
ESTABLISHED IN 1803

400 CHESTNUT STREET
PHILADELPHIA

Most Valuable — Most Perishable

EVERYONE has heard the wheeze about the dog running into the woods. "How long can a dog continue running into the woods?" was the question. To which was answered, "not very long, because after a while he is running *out* of the woods." Today the conviction prevails that although our business dog may still be in the woods, he actually is on his way out.

One sure sign of this is the resumption by so many concerns of those functions that were curtailed under the need or the dread of the last few years. After all, the victims of a cyclone cannot expect to spend the rest of their days in their cellars. There comes a time when they must venture forth and resume the normal processes by which they make their livings. And when that day comes, it is the alert and aggressive operator that gets going first who grabs off the advantages of the new start.

On every hand today forward-looking leaders are picking up the interrupted threads of their businesses. They are checking their products against new requirements, rebuilding their organizations to meet production conditions, surveying their channels of distribution in the light of what they have learned since 1929. All these are essential steps in the process of resumption.

Most urgent is the need to resume that vital process of rebuilding acceptance and recognition, for these are at once the most perishable and the most valuable assets of any business. Factory buildings may be slicked up, new equipment may be installed, even the product itself may be redesigned and improved, but unless the name and the product of a house are kept right up front in the mind of its market, all the rest may be wasted effort and expense. What the maker knows about his product does not make a prosperous business. Even a worthy product may fail to make it. The one factor that makes or breaks a business is what the *market* thinks of the house and its product.

So able and aggressive industrialists today are bending their best efforts to build their products into number one position in the mind of their new markets. This is not theory or surmise. It is based on definite knowledge of specific cases recently come to the attention of this writer. Naturally all cannot succeed in this bid for first position. But those who make the effort surely will be among the first to reestablish in their reviving markets the presumption of leadership that builds reputation.

As one manufacturer aptly put it, "I am going to make the name ——— so well recognized in its field that no buyer ever will feel that he must justify to his business associates, or to anyone else in the field, his selection of ——— equipment."

Wise man! For thereby, human nature being what it is, he attacks one of the most universal and deep-rooted of all the sales resistances. To help the buyer justify his judgment to himself and to those whose opinion he respects—that is a major objective to be sought in the process of maintaining an established reputation, restoring a dimmed reputation or building up a reputation in a new field.

No one dare forget this last. For in every field new starters now are crowding forward to challenge former leaders who counted too heavily on their momentum and have thereby left their leadership too long unguarded.

In this day of business resumption and rebuilding, no one value deserves more earnest or immediate consideration than that of reputation. Without it every manufacturer's plant is but a pile of building materials and his product but a more or less interesting toy.

Willard Chevalier

ENGINEERING NEWS-RECORD

Published every Thursday. Vol. 113, No. 6. Price 25c. per copy. Subscription, domestic, Mexico, Central and South American countries, $5 per year. Canada, including duty, $7.50. All other countries, $9 a year or 36 shillings. Entered as second-class matter April 11, 1917, at the Post Office at New York, N. Y., under the Act of March 3, 1879. Printed in U.S.A. Cable Address "McGrawhill, New York." Member A.B.P. Member A.B.C. Copyright 1934 by

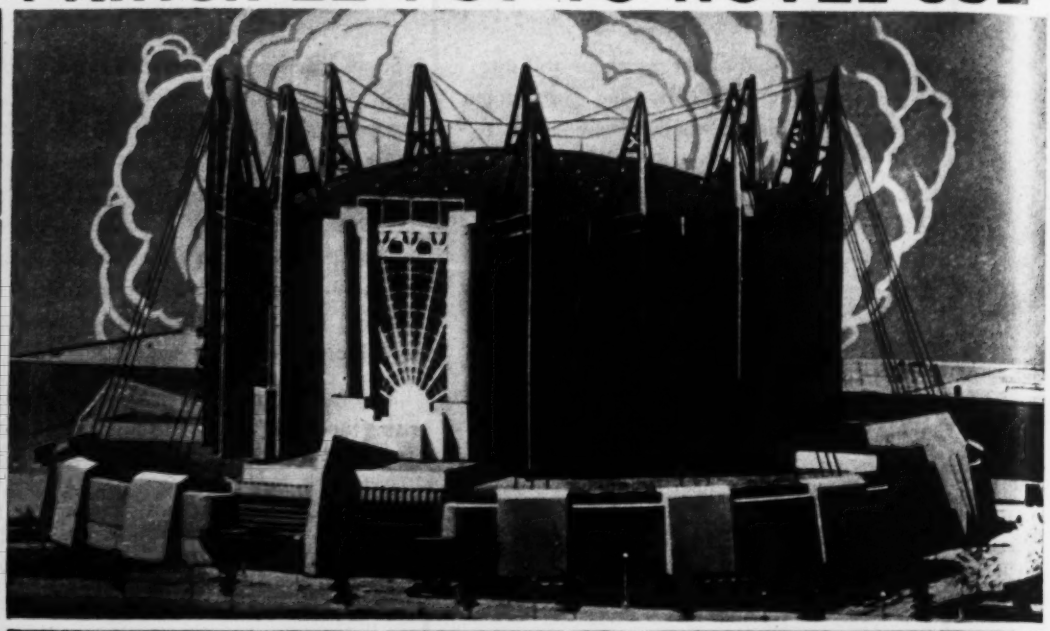
McGRAW-HILL PUBLISHING COMPANY, INC., 330 WEST 42d STREET, NEW YORK, N. Y.

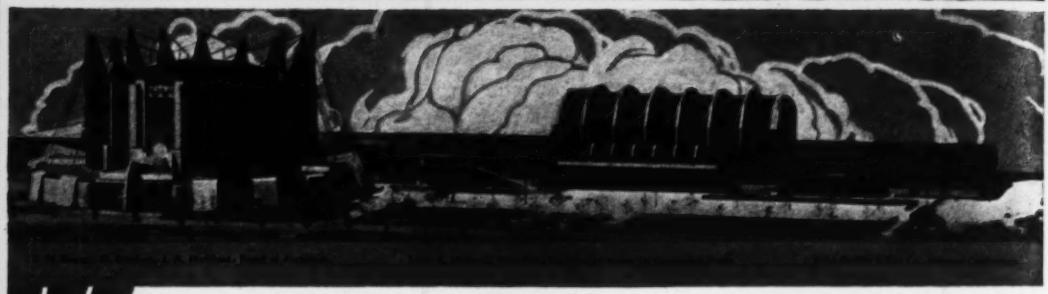
Editorial and Publishing Offices: 330 West 42d Street, New York; 520 North Michigan Avenue, Chicago; 883 Mission Street, San Francisco; Aldwych House, London, W. C. 2, England. Branch Offices: Washington; Philadelphia; Cleveland; Detroit; St. Louis; Boston; Greenville, S. C.

JAMES H. McGRAW, Chairman of the Board
MALCOLM MUIR, President
JAMES H. McGRAW, JR., Vice-Pres. and Treas.
MASON BRITTON, Vice-President
H. C. PARMELEE, Vice-President
HAROLD W. McGRAW, Vice-President
B. R. PUTNAM, Secretary

Printed by The Schweinler Press, N. Y.

THE SUSPENSION PRINCIPLE PUT TO NOVEL USE





Travel and Transport Building. All structural material, some 2500 tons in amount, furnished and fabricated by American Bridge Company.

¶ American Steel and Wire Company wire rope supports the "sky-hung dome"

THE Travel and Transport Building at the Century of Progress Exposition represents the new age as strikingly as any exhibit that it houses. For proper showing of the equipment of modern railway, air and water transportation, unprecedented requirements were involved. Very large spaces under roofs but free from obstruction by any supporting members, was the prime essential. To meet this requirement, the architects and engineers designed a structure as novel as it is efficient.

The interior comprises two principal rooms, one circular, one rectangular, besides a great deal of other space for various uses. Centered over the circular part, which is 300 feet in diameter, hangs the roof of a dome 206 feet in diameter, held 120 feet above the floor by steel cables. These are strung in the manner of a suspension bridge from twelve steel towers which form the sides of the central room. Over a section of the main rectangular part, the roof is supported by three-hinged steel arches. The housings of these arches, like the towers and cables that support the circular dome, are exposed and thus turned to full architectural account. The visible effect is wholly unique, and has attracted a great deal of attention.

Fabricators and Erectors of all classes of Steel Structures: Bridges, Buildings, Towers, Substations, Barges, Turntables.

AMERICAN BRIDGE COMPANY

SUBSIDIARY OF UNITED STATES STEEL CORPORATION

General Office: Frick Building, Pittsburgh, Pennsylvania

Contracting Offices: Baltimore, Boston, Chicago, Cincinnati, Cleveland, Denver, Detroit, Duluth, Minneapolis, New York, Philadelphia, Pittsburgh, St. Louis, Salt Lake City.

Pacific Coast Distributors: Columbia Steel Company, Russ Building, San Francisco. *Export Distributors:* United States Steel Products Company, New York.

ENGINEERING NEWS-RECORD

McGraw-Hill Publishing Co., Inc. Editorial and Publishing Offices: 330 West 42d St., New York

F. E. SCHMITT, *Editor* — WILLARD CHEVALIER, *Vice-President*

Editorial Staff
V. T. Boughton
W. G. Bowman
C. S. Hill
Chicago
W. W. De Berard

Editorial Staff
F. W. Herring
H. W. Richardson
J. I. Ballard
San Francisco
N. A. Bowers

CONTENTS FOR AUGUST 9, 1934

VOLUME 113 NUMBER 6 COPYRIGHT, 1934

Well-Points Dry Trench on Virginia Seawall..163

The Control of Artesian Water Supplies.....167
BY O. E. MEINZER

Laying a Subaqueous Steel Pipe Line.....170
BY WILLIAM C. CURD

Data on Plywood from Two New Test Series..172
BY GEORGE W. TRAYER

Engineering During Russia's Rehabilitation—I.177
BY ZARA WITKIN

Water Problems in Central Drought Area....181

Curvature Correction in Highway Earthwork.185
BY SIDNEY ROCHLIN

Editorials 186

Current News 188

New Equipment 194

In the News:

GREATEST HAVOC caused by the heavy rainstorms of last week in the eastern states was at Bridgeton in the southwestern corner of New Jersey. Failure of small dams on the headwaters of Cohansey River, which runs directly through the town, caused a flood putting all bridges out of service, disrupting the water supply and wrecking numerous buildings. Army engineers built a pontoon bridge for temporary service.

ADD MOMENTOUS DECISIONS: A committee of the St. Louis board of aldermen, casting about for ways and means of raising revenue, to offset an anticipated deficit, has proposed a tax of $25 a head on architects and engineers. Contractors, too, would pay a gross-profit tax. It must be the heat!

DESPITE the political tribulations of the new Federal Housing Administration, the opening gun in the home-modernization campaign is still timed for Aug. 15.

BARGAIN PRICES for materials and labor will not be urged by the Federal Housing Administration, according to Washington dispatches. This retreat from a major line of action comes at the same time that the A. F. of L. has stated its opposition to any reduction of building-trades wages.

A SUIT by a power company, to restrain a city from building a municipal plant with PWA funds, has reached the U. S. Supreme Court. The suit is brought by the Consumers Power Co., Portland, Me., against the city of Allegan, Mich., the recipient of a $410,000 loan and grant.

IN CONNECTICUT passenger cars travel at an average speed of 41.2 m.p.h. and buses at 43.1 m.p.h., according to a survey carried on since last fall under the direction of Prof. C. J. Tilden, of Yale. Some 45,000 cars were timed with a special speed detector. The fastest driver was clocked at 77 m.p.h.

RESIGNATION from the A. F. of L. of the local at the Hudson Motor Car Co., involving 7,000 men, and its intention to join the Associated Automobile Workers of America, were announced last week. Significantly, the latter organization is a so-called "vertical union" as contrasted with the craft unions of which the A. F. of L. is composed.

In This Issue:

TO PROTECT FORT MONROE from the storm-lashed waters of Chesapeake Bay, a new 16-ft.-high seawall is being built along 9,000 ft. of the east waterfront. Well points keep the foundation trench dry, a mobile platform carries seven pile-driving leads and a steam crane, concrete is placed by a paver with a 33-ft. boom, and traveling steel forms are used. The job is well equipped for rapid and efficient construction.

CONSERVATION of artesian water resources is becoming more and more a matter of first moment in those communities fortunate enough to have them. Basically, the problem is more legal than technical, but both phases are discussed in an article by O. E. Meinzer, of the U.S.G.S., in which he uses Honolulu and Roswell, N. M., as outstanding examples of cities exercising artesian water control.

THE LAYING of subaqueous pipe lines always provides opportunity for ingenuity. A steel line recently placed across the St. Joseph River at Fort Wayne, Ind., was hung between pontoons (made of pipe from the land portions of the line), was floated into place, and was lowered by hand winches into a dredged trench.

PLYWOOD, having demonstrated its usefulness and efficiency in numerous fields, is undergoing active investigation in several laboratories, to determine new uses and to secure qualitative data on behavior. Two test series recently completed at the Forest Products Laboratory of the U. S. Department of Agriculture concern the use of plywood as a covering for walls and for floors, with particular reference to prefabricating possibilities.

THE FIRST OF THREE ARTICLES analyzing Russia's accomplishments in construction under the five-year plans is published in this issue. It tells how actual accomplishment, while substantial, was short of the planned goal and discusses the economic and technical obstacles that were encountered.

AN EDITOR'S INSPECTION of the great central drought belt reveals many facts not contained in the daily accounts of high temperatures and no rain. In Kansas, Nebraska, Missouri, Oklahoma and the Dakotas, the rural population as well as some towns dependent upon small impounded surface supplies are the chief sufferers. City water supplies generally have proved adequate.

Coming Articles:

To complete the foundation record for the San Francisco-Oakland Bridge, the authors of the article on the unique domed caissons used in the West Channel (*ENR*, April 5, 1934, p. 431) have prepared a companion review of the work in the East Channel, where false-bottom caissons, one sunk to a depth of 234 ft., and an unusual type of sheetpile cofferdam were both used.

AMERICAN STEEL & WIRE COMPANY

WIRE FABRIC

THE STEEL BACKBONE OF CONCRETE

Traffic Conditions Demand This Protection

Thousands upon thousands of miles of reinforced roads and streets testify to the dependability of American Steel & Wire Company Electric Welded Wire Fabric. Highway and city engineers who desire concrete pavements that will lower maintenance costs, protect their reputation and protect tax-payers, specify this material. Our vast knowledge and resources are at your command, backed by more than a century of leadership.

1831 1934

AMERICAN STEEL & WIRE COMPANY

208 South La Salle Street, Chicago
94 Grove Street, Worcester

SUBSIDIARY OF UNITED STATES STEEL CORPORATION
AND ALL PRINCIPAL CITIES

Empire State Building, New York
First National Bank Building, Baltimore

Pacific Coast Distributors: Columbia Steel Company, Russ Bldg., San Francisco

Export Distributors: United States Steel Products Company, New York

ENGINEERING NEWS-RECORD

August 9, 1934

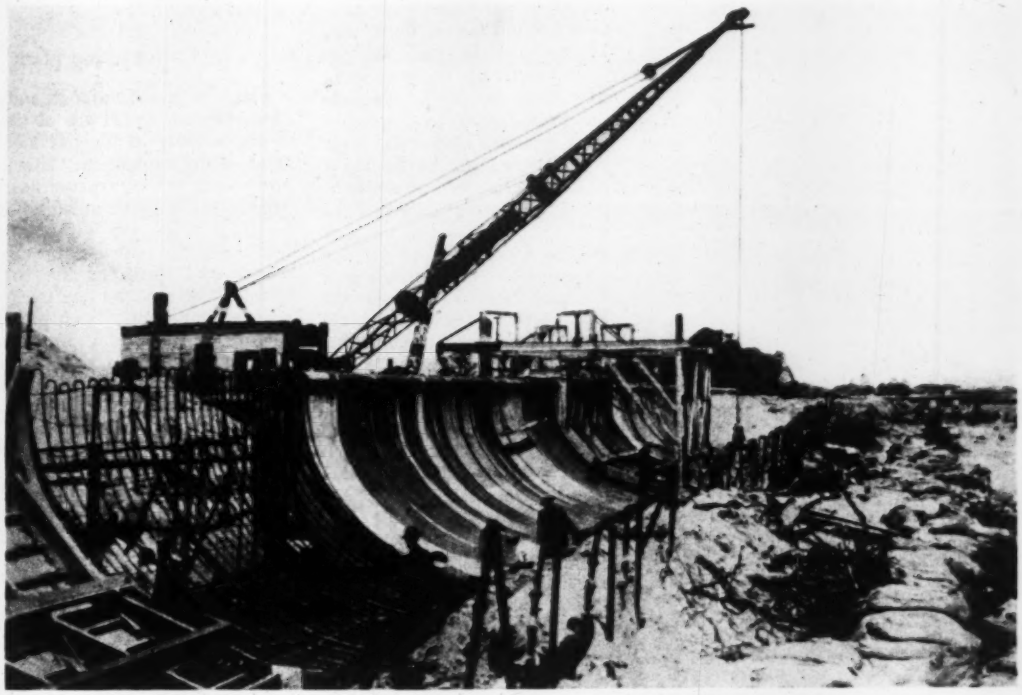


FIG. 1—WELL-POINT DRAINAGE SYSTEM and sandbag levee eliminate cofferdam in construction of Fort Monroe seawall, built on a tide-swept beach.

Well Points Dry Seaside Trench for Fort Monroe Wall Construction

Drainage system eliminates cofferdam in building 9,000-ft. concrete seawall at Virginia army post—Multiple-lead piledriver speeds up foundation work—Exposed face of wall designed as compound curve to deflect waves

LAST AUGUST hurricane winds whipped the waters of Chesapeake Bay across the low-lying spit of land comprising Fort Monroe, Va., at the junction of the bay and Hampton Roads, causing extensive damage. But pounding waves of similar storms in the future will be turned back by a heavy concrete seawall 15½ ft. high, now being built along the 9,000-ft. sandy beach facing the bay. Founded on wood piling, protected by a sheetpile cutoff wall, backed by a heavy fill and presenting a compound-curved face to the water side, the new wall is designed to give full storm protection to this old and important army post.

Although the wall is situated for much of its length on a tide-swept beach, the contractor dispensed with the usual cofferdam for this type of work and is successfully operating in a wide-open trench, 5½ ft. deep below high water, kept dry in 600-ft. lengths by two rows of well points, with a sandbag protection against high tides on the sea side. Occasionally an unusually high tide breaks through the sandbag levee and floods the trench, but within a few hours the well-point drainage system, supplemented by a surface pump or two, has the trench dried up and ready for resumption of construction activities. The job is well equipped for rapid and efficient construction, among the features being a multiple-lead piledriving rig that drives its own track supports, foundation piles and the cutoff wall; a paving

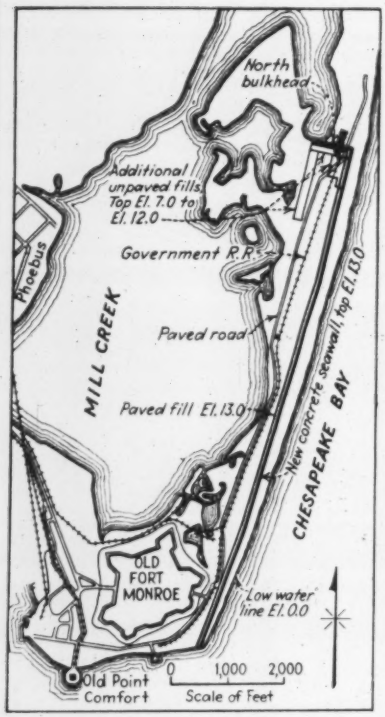


FIG. 2—NEW SEAWALL at Fort Monroe will protect the narrow spit of sand comprising the army post from storms sweeping in from Chesapeake Bay.

mixer with a 33-ft. boom that carries the discharge bucket to the top of the forms; and traveling steel forms.

Designed for overtopping waves

Though the wall faces the mouth of Chesapeake Bay, it is subject to storms sweeping in from the ocean. And while the top of the wall is 13 ft. above mean low water and 10 ft. above normal high tide (enough freeboard to take care of severe storm waves), the structure is designed to withstand the thrust of a wave overtopping the crest by 10 ft. Designed as a gravity section, the wall is 15 ft. wide at the base, 2 ft. 10½ in. thick at the toe, 15 ft. 6¾ in. high at the back and 3 ft. 1¼ in. wide at the crest (Fig. 4). The face is formed as a compound curve, tangent to a horizontal plane at the top of the toe, and curving beyond the vertical at the crest to turn the waves over and back seaward. The wall is founded on five longitudinal rows of 25-ft. wood piles extending 18 in. into the concrete. A cutoff wall of 25-ft. steel sheetpiles is driven 18 in. back of the face of the toe. Specifications call for a layer of 35-lb. roofing paper to be placed over the sand bed before deposition of concrete, to prevent absorption of moisture from the concrete by the porous sand. Both front and rear faces of the wall are heavily reinforced, part of the front reinforcing bars being hooked through holes in the sheetpiling.

The wall will be backed up for its entire length by a sand fill. To guard against possible erosion by overtopping waves, the top of the fill is to be covered with a 9-in. bituminous penetration seal of crushed stone and chips, and the back slope of the fill will be protected by a 12-in. layer of riprap with bitumen-filled joints. Thus, any water splashing over the walls will be swept on over the fill without causing any damage. The toe of the concrete wall will be protected by a course of riprap 7 ft. 4 in. wide and 4 ft. high. The front of the wall is to be backfilled to the top of the vertical toe face. At eight points along the length of the wall concrete stairways are to be built over the curved front face to provide access to the beach. The normal wall section is being carried through the sites of these stairways by the contractor, and the steps will be built later.

The new wall protects the entire east face of the outer end of the sand spit upon which the fort is located (Fig. 2). At the south end the wall ties into an existing concrete wall near the original fort, a massive stone structure, surrounded by a moat. At the north end, well beyond the location of the batteries comprising the present-day fortifications, the new wall turns westward for a short distance, tying into a new sheetpile bulkhead extending across the entire width of the spit. This bulkhead is protected on the north or front side by a riprap fill and several stone groins. Stormwaters are expected to sweep over the spit north of the bulkhead, and the groins are provided to prevent scouring of the wall. At the northeast corner of the bulkhead a low timber wall extends southward for some distance as a return wall protection against backwash. The north bulkhead is backed up by the same type of fill as is used behind the concrete wall. Additional backing and provisions for certain post facilities are provided at the north end by three unpaved fills built to a lower elevation than the top of the wall.

Construction plant

From a construction standpoint, the most interesting feature of the building of the wall is in the use and arrangement of the equipment. Starting at the north end, the contractor has the work organized to move steadily southward, completing the job within a stretch of some 600 ft. between opening of the trench and finish of the backfill. In general, the construction cycle is as follows: installation of well points on each side of the trench, digging of the trench with a crawler dragline, driving track support piles to carry the piledriver and later the form carriage, driving foundation piles and steel sheetpile cutoff, setting reinforcing bars on collapsible pipe cages, setting up steel forms, pouring concrete, stripping forms and placing backfill and front riprap, treatment of backfill surface and placing of riprap on backfill slope. The job is organized to complete 60 ft. of wall per day.

A government railroad and hard-surfaced highway run up the west side of the fort, providing easy access to the job. The contractor builds plank road spurs from the main road to the wall at intervals over which materials are trucked. Foundation piles are dragged in from the railroad by a team of mules.

In the vanguard of the construc-

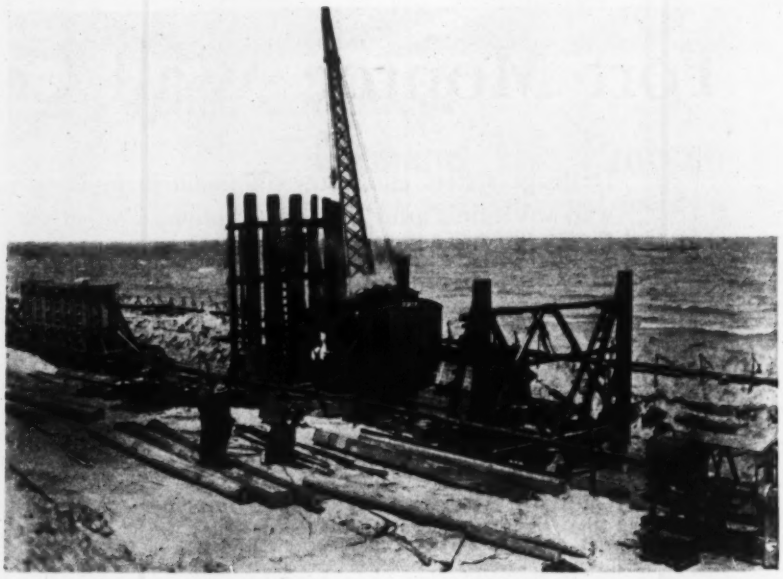


FIG. 3—SEVEN LEADS mounted on a traveling platform, which also carries a steam crane, comprise an efficient piledriving rig that keeps foundation work ahead of the fast-moving concrete gang. The two lines of well-point headers can be seen on either side of the trench.

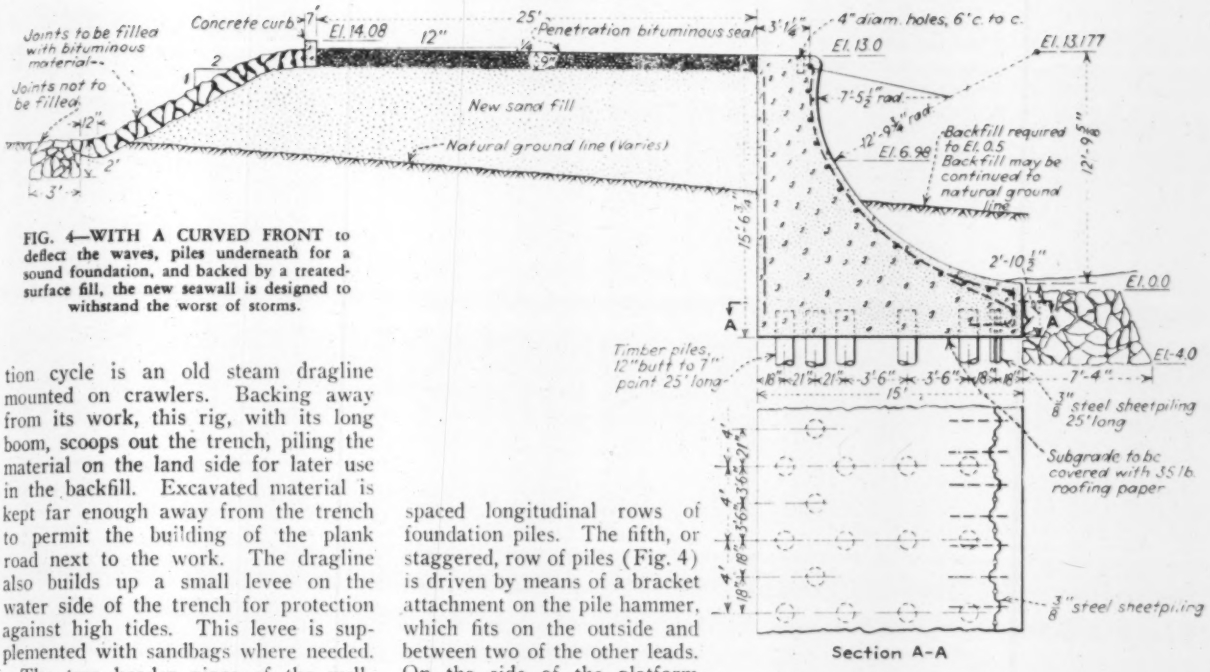


FIG. 4—WITH A CURVED FRONT to deflect the waves, piles underneath for a sound foundation, and backed by a treated-surface fill, the new seawall is designed to withstand the worst of storms.

tion cycle is an old steam dragline mounted on crawlers. Backing away from its work, this rig, with its long boom, scoops out the trench, piling the material on the land side for later use in the backfill. Excavated material is kept far enough away from the trench to permit the building of the plank road next to the work. The dragline also builds up a small levee on the water side of the trench for protection against high tides. This levee is supplemented with sandbags where needed.

The two header pipes of the well-point layout (Moretrench system) which are kept ahead of the trench excavation, are provided with taps every 3 ft. for point connections. As the trench is excavated, well-points are jetted down and hooked into the header lines. Spacing of the points varies with the water conditions, though, in general, on the seaward header the points are placed at alternate taps, or 6 ft. apart, and on the landward side are placed 15 or 18 ft. apart. Each header leads to a special gas-operated pump designed for well-point operation. The pumps operate continuously day and night. A third pump is kept in reserve.

Keeping the trench dry is the key to the entire construction operation. Specifications required a dry bottom before deposition of concrete and called for a cofferdam or other suitable means of keeping out the water. Most of the contractors bidding on the work intended to use a cofferdam, according to reports. The successful contractor attributes his low bid to the savings made possible by the use of the well-point drainage over cofferdam construction. The well-point system is working to the full satisfaction of all concerned.

Ingenious piledriving rig

The piledriving rig consists of a traveling platform mounted on an 18-ft. gage track, carrying multiple leads, a steam crawler crane and a jet pump (Fig. 3). The rails, placed on the trench bottom clear of the wall lines, are carried on longitudinal stringers supported on 20-ft. piles driven 10 ft. apart. At the front corners of the projecting traveling platform are short leads from which the track piles are driven. At the rear of the platform are four leads set for the four evenly-spaced longitudinal rows of foundation piles. The fifth, or staggered, row of piles (Fig. 4) is driven by means of a bracket attachment on the pile hammer, which fits on the outside and between two of the other leads. On the side of the platform toward the bay, near the rear, is another set of leads in which the sheetpiles for the cutoff are driven.

The steam crawler crane, set crosswise at the center of the platform, provides the driver with a full-revolving crane and steam for the hammers. One hoist line is reeved through a hook that handles the hammers; the other is used as a single line for placing the piles in the leads. A large double-acting hammer drives the wooden piles, and a smaller hammer of the same type is used on the sheetpiles. Although a jet pump is carried on the rig, it is seldom required in getting the piles down.

Once the track is set accurately to line, perfect alignment of piles is assured. A tranverse row of four foundation piles is driven at one setting, then the rig is moved ahead slightly to catch the odd pile. Track-support piles and the steel sheeting are driven along with the foundation piles as the rig moves into the correct position. The driver has a capacity of 100 piles per day, including the steel sheets.

Prior to start of work, test piles were driven by the army engineers to determine the average length required for a 20-ton loading per pile. In most cases a 25-ft. pile is long enough, but occasionally a lens of soft, peaty material is encountered, requiring substitution of a longer stick. Piles are cut off to specified grade by hand. Excavation of the dragline produces a

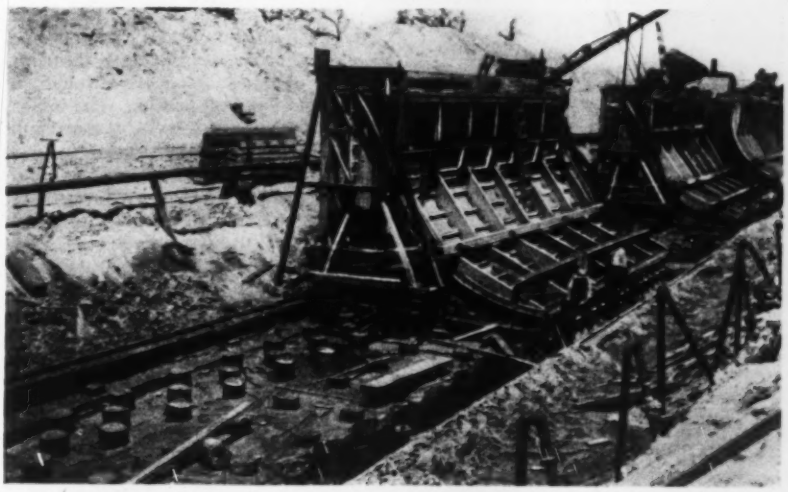


FIG. 5—STEEL FORMS are tied down to the cutoff sheeting to resist the uplift at the curved toe. Tracks laid by the piledriver and used later by the form gantry define the limits of the trench.

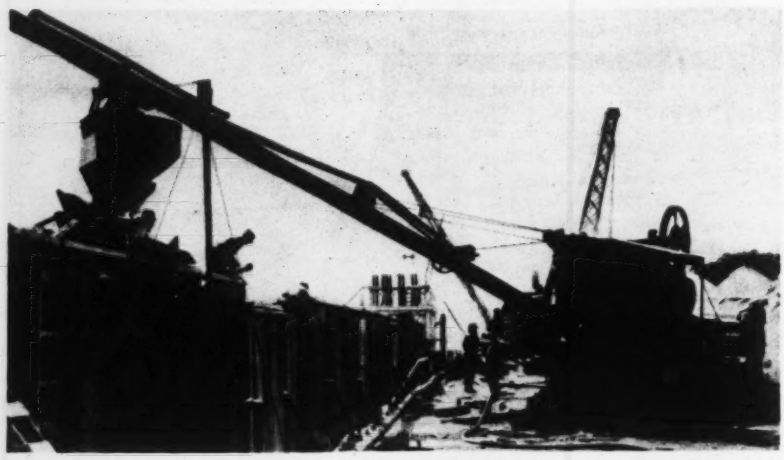


FIG. 6—A 33-FT. BOOM on a 28-E paver comprises the simple concrete-placing plant. Materials are dry-batched 2 miles away and delivered by trucks.

trench fairly true to grade, but during driving of the piles a swelling of ground occurs, requiring final excavation to grade by hand.

Traveling steel forms

The wall is being built in alternate sections 30 ft. long (Fig. 1). Concrete is poured from base to top in each block in one continuous operation. Four sets of traveling steel forms are used, two with steel-end bulkheads for the advanced sections and two without ends for closure blocks. The forms are moved by a gantry traveling on the same rails as the piledriver, which picks them up intact. On the two advance sections the bulkheads are hinged at the back side so that they can be swung clear of the wall and moved with the remainder of the forms.

Considerable uplift is developed in the forms at the lower side of the front face. To counteract this, the form is tied to the sheetpiling by means of bolts and turnbuckles (Fig. 5). The forms are blocked up on jacks resting on timber blocking or on top of the foundation piles. Bracing against the track stringers holds them in alignment.

Before the forms are set, the reinforcing is built up in place as cages. An ingenious collapsible pipe assembly (Fig. 7) is set up to support the bars until the cage is completed. Then the frame is collapsed and taken out between the bars.

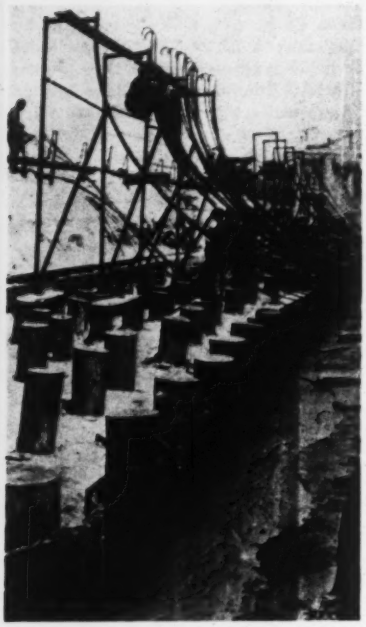


FIG. 7—COLLAPSIBLE pipe frame serves as a support for the heavy reinforcing until the bars are tied up in self-supporting cages.

Paving mixer with long boom

The concrete plant is extremely simple, consisting of a 28-E paver with a special 33-ft. boom. Operating on this boom is a 1-yd. bucket that carries the concrete to top of form (Fig. 6). For the lower portion of the form the concrete is dumped to place through a hopper and flexible spouting. The mixer travels alongside the wall on the plank road. In general, concrete is spaded into place. As an experiment, several types of internal and external vibrators are being used, to determine the effect of vibration on the concrete.

Materials are dry-batched, including bulk cement, at a plant at Hampton, across Mill Creek from the fort. They are hauled to the job in three-batch trucks. Sand and gravel come by barge down the James River from Richmond. Bulk cement is delivered to the batching plant by rail and is unloaded and stored mechanically.

A large wide-gage steam boiler crane completes the major plant items. This rig, equipped with a clamshell and operating on rails back of the wall, excavates the toe trench for the front riprap protection, places the stone and then the necessary front backfill. It also places the bulk of the main backfill, using the trench material piled up by the dragline and additional sand brought in by trucks. Auxiliary crawler cranes place and trim the backslope of the fill and place the heavy riprap on this slope. The additional sand required for filling comes from the beach north of the job, where it is loaded into trucks by a crane and clamshell. Riprap stone is received by rail, unloaded by cranes and hauled to the site by trucks.

The seawall is being built under a PWA allotment to the Corps of Engineers, U. S. Army. It was designed and is being built by the U. S. District Engineer office at Norfolk, with Major G. R. Young, district engineer in charge. Up to the time of his transfer to other duties in July, 1934, Capt. M. J. Noyes was acting district engineer and directed construction operations. F. E. Johnson, associate engineer, and L. E. Bozarth, chief inspector, are in immediate charge.

Contract was let in January, 1934, to the Merritt-Chapman & McLean Corp., Baltimore, for $857,125, with 360 working days stipulated as completion time. Grover Denny is superintendent for the contractors, assisted by E. E. Blake and Ed Coblentz, engineers.

Hydraulic Fenders on Piers

Hydraulic fenders form a novel equipment for the LeVerdon steamship landing pier at Bordeaux, France. They are not continuous but are spaced about 100 ft. apart along the face of the pier, the fenders being about 20 ft. in depth below the deck of the pier. Each fender, weighing some 30 tons, consists of two vertical steel frames having curved outer members to which are attached horizontal timbers forming the face of the fender. The frames are hung from bearings a little below the deck and are so counterweighted as to hang normally, inclined outward from the vertical line of the pier. To each frame is attached a connecting rod from an oil cylinder mounted in a chamber under the deck and having small pipes leading to an oil main with surge or pressure tank. As a ship comes alongside the pier, its force causes the fenders to swing inward, driving the oil out of the cylinders through the small pipes. When the pressure is again relieved by the departure of the ship, the counterweights return the fenders to normal position, the oil then flowing back into the cylinders. The principle is similar to that of the hydraulic bumpers or buffers used in many large railway terminals in England and Europe. The fenders were designed and built by the Société Industrielle de Matériel d'Entreprise et de Construction, of Paris.

Progress in the Control of Artesian Water Supplies

Appreciation of the importance of underground water resources has stimulated study of artesian water supplies and a program of conservation—Two important examples are at Honolulu, T. H., and Roswell, N. M.

By O. E. Meinzer

Geologist in Charge, Division of Groundwater United States Geological Survey

The steadily increasing importance of groundwater resources emphasizes the value which should be placed on artesian sources by those communities having this type of water supply. Although the spectacular and better known water-supply projects involve the development of surface supplies, extensive areas in this country will continue to depend upon the vast underground resources utilized through wells. In the gradually expanding demand on these subsurface resources, it is almost inevitable that those with artesian characteristics, resulting from a fortunate combination of hydrographic and geological conditions, should be affected first. The broad subject of groundwater resources is of increasing concern in the field of water supply engineering and this article outlines some general recent developments with particular reference to the study of artesian supplies and their conservation. Some of the data contained in this review were presented at a meeting of the Society of Economic Geologists, Princeton, N. J., July 7, 1933, by Mr. Meinzer.—Editor.

IT HAS BEEN almost 50 years since the U. S. Geological Survey published the outstanding paper on requisite and qualifying conditions of artesian wells, prepared by T. C. Chamberlin as a result of several years of intensive study of artesian conditions in Wisconsin. Since the appearance of that paper many investigations have been made and numerous reports have been published on artesian water by federal and state agencies. Nearly all these reports contain warnings that artesian supplies are not inexhaustible and exhortations against the waste of water through unregulated flowing wells. Almost invariably, however, these warnings have gone unheeded.

The first lowering of the pressure head in artesian wells usually passes unnoticed and causes no concern. It is only when the head and flow decline to the extent of causing serious inconvenience or financial loss that public attention is attracted to the situation. The result, in some cases, tends to approach a state of panic. In several states regulatory laws have been passed at this early stage, but most of these laws have been hastily prepared, without adequate understanding of the intricate physical and legal problems involved and, therefore, are impossible of effective enforcement. Consequently, an attitude of helplessness and cynicism has developed toward any efforts at conservation and regulation of artesian water supplies.

Although past failures resulted in some discouragement and inaction, they led gradually to a better appreciation of the nature and magnitude of the problems involved. As a result, in at least a few areas, recent programs of conservation have been undertaken that have been more carefully planned and are being effectively carried out. In these areas the decline in artesian pressure has been arrested, and to some extent there has been a recovery of pressure head. These tangible evidences of successful control have produced a marked change in public attitude. Discouragement and criticism are being replaced by an attitude of cooperation and support for administrative agencies.

Although much artesian water has been wasted, it is not too late to introduce effective programs of conservation. In many artesian basins the pressure head has seriously declined. An example is the head of the artesian supply in the vicinity of Woonsocket, S. D., which declined from an original pressure of about 250 lb. per sq.in. in 1892 to 35 lb. in 1923. However, with lower pressures, regulation becomes more feasible, and a higher degree of conservation may be attained. It is difficult to construct or control artesian wells which develop high pressure, and these high pressures increase the quantity of wastage through uncapped or defective wells.

As a result of the great improvements that have been made in recent years in the methods of drilling, developing and finishing water wells, and in pumping machinery and power installations, it has become more feasible and less expensive to pump underground water. The advantage of high head in artesian supplies has become less important than efficient and equitable regulation.

The great value of the natural underground reservoirs as sources of public water supply and the importance of their vast storage capacity were especially emphasized during the drought of 1930, when acute shortage developed in the supplies of many cities, but those supplies obtained from large artesian reservoirs were quite unaffected. After a thorough hydrologic investigation of the artesian reservoir underlying Memphis, Tenn., for example, it was possible to predict with much confidence that in 1930, as well as in any other year, it would yield about 1 m.g.d. per foot of drawdown in the pumping district. The increasing appreciation of the value of these underground reservoirs tends to promote and support any properly planned method for conservation.

Honolulu and Roswell basins

Perhaps the two best examples of successful conservation are afforded by the work in the artesian basin of Honolulu and the Roswell basin in the Pecos Valley, N. M. Several years ago intensive hydrologic investigations were undertaken in both of these areas with a view to remedying, if possible, the serious conditions which had developed with respect to the water supplies. In the Honolulu basin, where nearly the entire water supply is obtained from artesian wells, there had been a persistant decline in artesian head for many years, and the city was threatened with a water shortage and with contamination of the supply by salt water that was rising in the artesian basin as a result of the loss of counter pressure from the fresh artesian water. The situation was one of deep concern to all public-spirited citizens.

In the Roswell basin, where 60,000 acres of land depend upon irrigation from artesian water, there had been two decades of lavish use of this supply, with persistent lowering of the head. This condition had ruined many of the farmers and threatened the others more seriously each year. The adverse conditions were closing in from both sides —from the upper part of the basin, where the wells ceased flowing and the pumping lift became too great for profitable irrigation; and from the lower part of the basin, where the accumulation of wasted artesian water was damaging the soil by waterlogging. The prevailing attitude of the people was one of almost grim resignation to the inevitable, and the new investigation and program of conservation were at first regarded rather cynically as just another ineffectual gesture.

Flow under control

We now have the satisfaction of having under control, at least to some extent, these two great natural water-supply systems. In both basins the waste has been eliminated to a large extent, and the rate of withdrawal is well under control. In both basins the long downward trend of the artesian head has been arrested, and a distinct reversal has been registered. It should be recognized that to some extent, not easily evaluated, the reversal of head has resulted from favorable rainfall conditions, which tended to increase the rate of recharge and to decrease the rate of withdrawal, and also to conditions during the past few years which have tended to decrease the use of water.

The test of our conservation programs may still lie ahead of us. However, the fact has been demonstrated that artesian head will rise and a reser-

voir will refill whenever the rate of withdrawal is kept below the rate of recharge, and that by wisely directed human endeavor the withdrawals can to a great extent be regulated. In both basins the people have recognized that these two important facts have been demonstrated, and they understand their significance. The change in the attitude of the public has been remarkable. The attitude of discouragement and cynicism has disappeared and, instead, there is a prevailing attitude of achievement and hopefulness and of support for the local, state and territorial agencies responsible for the administration of the program of conservation and regulation.

The results thus far attained have not been the accomplishment of a few individuals but have been achieved through the cooperation of many earnest workers. Special mention should be made of the staff of the Honolulu board of water supply and of the New Mexico state engineer and his assistants, with whom the geologists and engineers of the United States Geological Survey have cooperated. In both communities there has been exceptionally strong and intelligent support from public-spirited citizens in positions of leadership.

Conservation procedure

Any program planned to bring about effective control of an artesian basin should include three well-coordinated steps: (1) a thorough hydrologic study of the basin and an investigation of the mechanical difficulties to be overcome in the prevention of waste, as a foundation of basic facts for constructing a plan of conservation and regulation; (2) a program of education to present the facts to the public and create a wholesome and intelligent public opinion; and (3) a well-considered legislative plan with provision for adequate enforcement of the law.

Any thorough hydrologic investigation of an artesian basin must be founded on a study of the stratigraphy and geologic structure. It must include a study of the source of the supply, the direction in which the underground water moves and the location and manner of its disposal. A contour map of the piezometric or artesian-pressure surface will show the direction of movement of the water in each part of the basin and is an important aid in tracing the course of the water from intake to discharge.

The investigation must include a study of the quantity of water stored in the artesian reservoir, the rate of recharge, the rate of natural discharge, the quantities withdrawn from wells, and the waste from wells, both at the surface and underground. The capacity of the water-bearing formation to conduct water from the intake area to the location of the wells must be investigated, as it is the limiting factor in safe yield.

The investigation should include the compilation of all available information as to the quantities of water withdrawn since the first development in the basin, as well as the original artesian head and the change in head during subsequent development. Observation wells should be selected for periodic measurements of water levels or artesian pressure, and some of these should be equipped with automatic recorders. A continuing record should also be obtained of the withdrawals of water, to provide a long-term correlation between withdrawals and head.

Before any attempt is made to stop artesian-well waste, studies should be made to determine the quantities of water wasted, the cause of the waste and the mechanical operations and installations required to stop it, together with an estimate of the cost of this work compared to the resulting benefits derived. Waste occurs partly at the surface and partly through defective or corroded casings below the surface. Obviously the underground waste is the more difficult to detect and to stop.

Stopping underground waste

In recent years the Geological Survey has devised considerable apparatus for the exploration of artesian wells. A deep-well current meter with accessory handling apparatus has been developed and has been used successfully in Hawaii, New Mexico, Texas, Florida and New Jersey. With this meter it is possible to determine the horizons at which water enters a well and the rate of inflow at each level, also to locate points of leakage and usually to determine the amount. Electrolytic apparatus for determining the salinity of water at any depth and deep-well samplers of two different types have also been developed. These are useful in determining the chemical characteristics of the water at each horizon and to detect the depths where harmful amounts of salt water may be entering.

In Honolulu the cavernous basalt containing the artesian water is overlain by: (1) sedimentary deposits that include clayey strata that serve as the confining beds; and (2) coral limestone and other permeable materials that contain sea water. The casing in many of the older wells had corroded at the salt-water horizons and allowed the artesian water to escape in large quantities. At the outset of the leakage survey the static pressure of each artesian well that could be located was measured. If the pressure of the well was found to be subnormal for that particular part of the artesian basin, the well was then explored with a current meter to detect leaks. After the leaks had been located and the rates of leakage approximately determined, steps were taken to have the defective wells either repaired or sealed. The work was done by experienced well drillers under strict supervision and inspection by government engineers. Provision was wisely made whereby the cost of sealing wells was, under certain conditions, borne by the territorial government.

Ten m.g.d. saved

The program of exploring and repairing or sealing defective wells in the Honolulu basin is now nearly complete, after about fifteen years of systematic effort. The result is the saving of about 10 m.g.d. of fresh artesian water, which is about half the daily consumption from the public supply of the city of Honolulu. Thus, a valuable water supply has been salvaged, and control has been secured over a situation that would otherwise have become worse from year to year.

One feature of this survey was the effort made to find abandoned wells, not evident at the surface, which could be located only by the aid of old records. One well that had been buried and lost since 1885 was finally discovered and sealed at a cost of only $1,500. It was estimated that this well had been wasting about 500,000 gal. of water a day for 40 years, or a total of about 7,000 million gallons, which equaled all of the water pumped from artesian wells and tunnels for municipal use during the year 1932. It is believed that seven lost wells still remain in the city.

The work done in the Roswell basin in exploring and sealing wells has been described in *Engineering News-Record* of March 3, 1932, p. 325, and Nov. 16, 1933, p. 598. The conservancy district has now virtually completed the leakage survey and has made much progress in a systematic program of repairing or sealing defective wells, largely at public expense. The outstanding achievement in connection with the program in the Roswell basin, however, has been the enactment and enforcement of laws establishing artesian water rights and prohibiting overdraft.

Legal regulation

Legal control of artesian water relates (1) to the proper construction and operation of wells and (2) to the equitable distribution of the water. Control of construction and operation of wells are based on the principle of preventing waste under the police powers of the state, and laws prescribing regulations to effect this type of control have generally been supported by the courts. The successful application of such laws depends upon their practicability as well as the attitude of the administrative officials and the public. Both the territory of Hawaii and the state of New Mexico had laws for many years regulating the methods of constructing artesian wells and the type of casing to be used, and prohibiting surface and underground waste of artesian water. These laws have been improved and strengthend from time to time as dictated by experience. Although there has been strict enforcement

only in the last few years, the laws from the beginning have been of benefit in eliminating the flimsy type of casing and the careless methods of construction that characterized the early period of development, and in providing some degree of regulation in capping wells when not in use.

The equitable distribution of available underground water supplies is a subject that has been clouded by confusing and conflicting court decisions. The situation has resulted largely from the precedent of decisions rendered in the past, under conditions different from those that prevail at present, and on the old assumption that artesian water, being out of sight, is a mysterious thing on which no definite information can be obtained. Three general doctrines have been developed by the courts regarding the distribution of artesian and other underground water among the owners of land on which water can be withdrawn through wells. These may be referred to broadly as: (1) the doctrine of unrestricted use, (2) the doctrine of correlative rights, and (3) the doctrine of prior appropriation for beneficial use.

Under the first-two of these doctrines, any person who expends time and money in developing an underground water supply for irrigation or other use has no legal security for this supply because all or a large part of it may at any time be taken away by other landowners who have previously done nothing to develop or utilize this natural resource. Obviously such conditions make the development of underground water supplies a hazardous undertaking, and are adverse to effective regulation and conservation.

No legal protection

For example, a study made by the Geological Survey indicates that in the Milford district, Utah, the available underground water is only sufficient to irrigate about 3,500 to 4,000 acres. Settlers have come into this district and after the expenditure of much effort and money have converted barren desert land into productive farms irrigated with this pumped supply. Under the doctrine of prior appropriation for beneficial use, which applies to surface-water supplies in most of the arid West, these pioneer farmers would be protected in their water rights. But under the doctrine of correlative rights there would be nothing to prevent others from coming into the district and virtually ruining the present development by drilling wells on other available land, thus depriving the original cultivated area of most of this water supply. The application of the doctrine of prior rights, however, necessitates the acquisition of definite technical information on the underground water supplies in each area to be regulated.

The Supreme Court of the territory of Hawaii has upheld the doctrine of correlative rights but, at the same time, has supported the strict legal regulation for the prevention of waste. On the other hand, the Supreme Court of New Mexico has given full support to the doctrine of prior appropriation for beneficial use, which literally extends the surface-water doctrine of the arid West to the control of underground supplies.

Prior rights upheld

A recent opinion rendered by Justice John C. Watson, of the New Mexico Supreme Court, includes the following statement on correlative rights as compared to the principle of prior appropriation:

"According to the 'correlative rights' doctrine, each overlying owner would have the same right—the right to use whenever he saw fit. The right does not arise from an appropriation to beneficial use, which develops the resources of the state. It is not lost or impaired by non-use. Regardless of the improvements and investments of the pioneers, later comers or later developers may claim their rights. The exercise of those rights which have been in abeyance will frequently destroy or impair existing improvements and may so reduce the rights of all that none are longer of practical value and the whole district is reduced to a condition of non-productiveness. The preventive for such unfortunate and uneconomic results is found in the recognition of the superior rights of prior appropriators. Invested capital and improvements are thus protected. New appropriations may thus be made only from a supply not already in beneficial use. Non-use involves forfeiture. A great natural public resource is thus both utilized and conserved."

In the early development of the use of underground water supplies the chief obstacles to conservation were the assumption of an inexhaustible supply and an extreme attitude respecting the sanctity of property rights. In the second stage of development, the chief obstacle has been the belief that the saving of water by the individual was useless because no general program of conservation could be enforced. In the future one of the most potent threats to any program of conservation will probably come through the self-interest of individuals who would profit by new water-supply projects. Even after the best of laws have been enacted and approved by the courts, eternal vigilance will be required by able and honest administrators and by the people to provide adequate support to these administrators in their difficult task of conserving the underground water and providing for its equitable and beneficial distribution.

BIBLIOGRAPHY

Chamberlin, T. C., "The Requisite and Qualifying Conditions of Artesian Wells"; U. S. Geological Survey, 5th Annual Report, pp. 125-173, 1885.

Fiedler, A. G., Report on investigations of the Roswell artesian basin, Chaves and Eddy Counties, N. M., during year ending June 30, 1926; *New Mexico State Engineer*, 7th Biennial Report, pp. 21-60, 1926.

Fiedler, A. G., "Deep-Well Salinity Exploration," Amer. Geophysical Union *Transactions*, 1933, pp. 478-480, 1933.

Fiedler, A. G., and Nye, S. S., "Geology and Groundwater Resources of the Roswell Artesian Basin, N. M."; U. S. Geological Survey, Water-Supply Paper 639, 1933.

McCombs, John, and Fiedler, A. G., "Methods of Exploring and Repairing Leaky Artesian Walls"; U. S. Geological Survey, Water-Supply Paper 596, pp. 1-32, 1928.

Meinzer, O. E., and Hard, H. A., "The Artesian Water-Supply of the Dakota Sandstone in North Dakota, with Special Reference to the Edgley Quadrangle"; U. S. Geological Survey, Water-Supply Paper 520, pp. 73-95, 1925.

Meinzer, O. E., "Groundwater in the Hawaiian Islands"; U. S. Geological Survey, Water-Supply Paper 616, pp. 1-28, 1930.

Meinzer, O. E., "Notable Improvements in Groundwater Development"; *Engineering News-Record*, Vol. 110, pp. 750-752, 1933.

Palmer, H. S., "The Geology of the Honolulu Artesian System"; Honolulu Sewer and Water Comm. Report for 1927, Supplement to 1927.

Wells, F. G., "A Preliminary Report on the Artesian Water Supply of Memphis, Tenn."; U. S. Geological Survey, Water-Supply Paper 638, pp. 1-34, 1932.

Wells, F. G., "Ground Water in Western Tennessee"; U. S. Geological Survey, Water-Supply Paper 656, 1933.

White, W. N., "A Method of Estimating Groundwater Supplies on Discharge of Plants and Evaporation from Soil—Results of Investigations in Escalante Valley, Utah"; U. S. Geological Survey, Water-Supply Paper 659, pp. 1-105, 1932.

Honolulu Board of Water Supply, Report for 1931-32, pp. 3-4, 195-226, 1933. See also reports of the Honolulu Sewer and Water Commission and of its successor, the Honolulu Board of Water Supply, for other years.

Water-Power Plants Increase Capacity in 1933

The total capacity of water wheels at water-power plants in the United States on Jan. 1, 1934, according to the annual report just released by the Department of the Interior through the Geological Survey, was 15,913,451 hp., an increase during the year of 95,500 hp.

Five states—New Hampshire, Massachusetts, Pennsylvania, Michigan and Wisconsin—show an increase in capacity of water wheels of more than 10,000 hp. from the figures published in the previous annual report. Washington shows a decrease of more than 10,000 hp., and a few states show minor decreases, attributable to abandonment of some plants and changes in capacity of others.

An estimate based on the present practice of installation of water wheels at fully developed water-power sites indicates that water wheels with a capacity of about 80,000,000 hp. would be required to make use of all the potential water power in the United States. Therefore, about 20 per cent of the nation's water-power resources is developed at the present time.

Subaqueous Steel Pipe Line Lowered from Pipe Pontoons

St. Joseph River crossing of 42-in. water main at Ft. Wayne, Ind., placed by economical and fast method—Pipe-line material used for pontoons

By William C. Curd
Consulting Engineer, Cincinnati, Ohio

INCLUDED in extensive water-supply improvements just completed at Ft. Wayne, Ind., was a 42-in. steel pipe line 12,360 ft. long. To reach a new filtration plant at the juncture of the St. Marys and St. Joseph Rivers, it was necessary to cross the St. Joseph with a subaqueous line. An interesting and economical method of placing this underwater section was worked out, involving the use of 42-in. pipe pontoons, which were later dismantled and used elsewhere in the new pipe line.

The comprehensive improvements in the city water facilities were occasioned by a change in the source of supply from groundwater to river water. The new filtration plant is located near the business district. At the northerly limits of the city, waters of the St. Joseph River have been impounded by a new concrete dam. Raw water is taken from the river above the dam by low-pressure pumps and carried to the filtration plant through the 42-in. steel supply main. The route of the pipe line is through public streets and city property and, in order to hold to this procedure throughout, the river crossing at the foot of Parnell Ave. was imperative.

The pipe for the entire line, fabricated with longitudinal welded seams, was furnished in standard straight lengths of 40 ft., with variable lengths for the specials. Except for five joints in the subaqueous sections and several at valve connections, Dresser-type bolted couplings were used for field joints.

A short distance below the junction of the two rivers a roller-type dam has been in operation for several years by which the stages of these rivers may be regulated. By raising the rollers during normal summer stages, the water level can be lowered approximately 4 ft. at the point of the pipe-line crossing. The bolted pipe joint and the control of river stages by means of the roller dam were taken advantage of in designing the simple and economical method used for installing the pipe under the river, which permitted the subaqueous pipe section to be floated into place and sunk to grade as a unit (Fig. 4).

The bed of the river was excavated to grade, from 19 to 21 ft. below normal river stage, by means of dragline and clamshell buckets (handled by a crawler crane on each bank) and by an open-bottom drag scraper running on an overhead cable from the crane on the right bank to a crawler tractor traveling on the left bank. The flexibility of such an arrangement permitted the dragging and spreading of the excavated material along the right or concave bank without removing it from the stream, except for a small amount that was piled above water line for shore restoration. Dragging operations extended over an area 50 ft. up and down stream from the pipe center line, this distance being found necessary to maintain a stable slope in the bed of the river.

The riverbed formation was a heavy layer of silt and sewer washings, underlaid with gravel and sand, which necessitated the driving of about 1,000 lin.ft. of steel sheetpiling as a retaining wall along each bank, to prevent sloughing. A fairly accurate and uniform grade along and adjacent to the center line of the crossing was obtained with the aid of frequent soundings. It was

FIG. 1—SUBAQUEOUS SECTION of Ft. Wayne's new 42-in. steel water main was placed with aid of pontoon assembly made up of standard pipe sections.

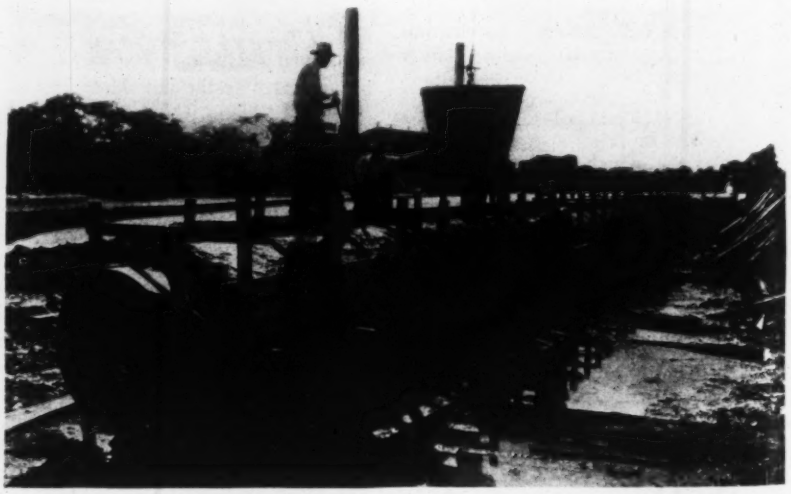


FIG. 2—CONCRETE PROTECTION COAT 6 in. thick was placed around the subaqueous pipe-line section prior to sinking. The pipe-line and pontoons were assembled at this location, and the whole assembly was floated by raising the river level by closing gates on a dam downstream.

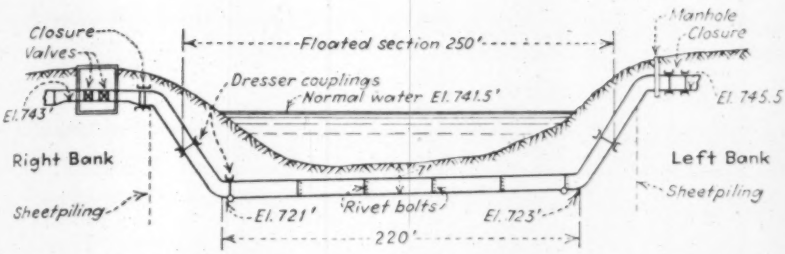


FIG. 3—DIAGRAM of water-main crossing of St. Joseph River, Fort Wayne.

found from the soundings that sand was drifting along the bed, but not at a rate to hamper operations. The only delay encountered in the excavation was in the removal of a large cottonwood stump thoroughly embedded on the trench center line near midstream. Several heavy charges of dynamite were required to shatter it for removal with a bucket. After the pipe line had been sunk and set at grade, backfilling was done with the open-bottom drag scraper. Slopes were replaced by picking up the reserve piles on each bank with a drag bucket.

Fabricating subaqueous section

In preparation for commencement of operations on the crossing, the rollers in the dam were raised. While the water was falling, the slope on the left bank, at a point 600 ft. above the crossing, was benched out 20 ft. wide and down to the lowered water surface for a distance of 300 ft.

On this bench and resting on mud sills, five straight sections and one elbow section of the subaqueous line were assembled (Fig. 1). Instead of the bolted connection used elsewhere in the pipe line, the five joints in this section were made with $\frac{7}{8}$-in. rivet bolts, with the rivet heads and inside and outside girt seams electrically welded to insure both watertightness and strength.

The specifications required a 6-in. protective coating of concrete around the pipe for the entire length of the crossing. This concrete shell was applied to the pipe while it was still resting on the mud sills, as shown in Fig. 3. Wire-mesh reinforcing was used, to insure adherence to the pipe and to protect against shrinkage cracks.

Immediately after concrete operations were completed, assembly of pontoons was begun. The pontoons, 240 ft. in length, were made up of twelve 40-ft. sections of 42-in. pipe, six sections being placed on each side of the pipe line, laid on the mud sills. Joints in the pontoons were made with Dresser couplings, each one reinforced with four 1x22-in. bolts, placed at quarter points and extending across the coupling to $\frac{1}{2}$x3-in. clips welded to the pipe. This latter feature was a safeguard against any tendency of the joints to open while the pontoons were under load. The open ends of pontoons and subaqueous pipe were closed with light steel bulkheads.

The pontoons were tied together with a deck of 8x8-in. oak sills 14 ft. long, spaced at intervals of 8 to 10 ft., each attached to a pontoon with $\frac{1}{2}$-in. U rods. The sills were cross-braced on top with 2x6-in. oak planks, spiked at ends and center. Thirteen pairs of worm-driven winches were placed at proper intervals on the deck sills, and from these winches the subaqueous pipe was suspended with thirteen $\frac{3}{4}$-in. steel cables looped under the pipe, one cable to each pair of winches, with an equal amount of cable wound on each drum. The power developed through these winches, when operated in unison, was adequate to raise or lower the subaqueous section as desired.

Upon completion of the pontoon assembly, the lower river dam was closed, and the resultant rise in water gradually put the entire assembly afloat. The assembly was then moved downstream about 200 ft. and anchored to await completion of excavation of the trench.

The original design provided for assembling both elbows on the subaqueous section, but some fear was expressed concerning the added overturning effect of the second elbow section. However, after the structure was afloat, it was found to be so well balanced that the other elbow was attached by grounding one end so the connection could be made.

The entire assembly, including pontoon pipe, subaqueous section with concrete coating, decking, winches,

DISTRIBUTION OF TIME REQUIRED TO PLACE SUBAQUEOUS SECTION

Item	Hand Labor, Hours	Crane Time, Hours	Tractor, Hours
Assembling pipe and pontoons	745	93	.....
Placing concrete	455	34	.....
Sinking subaqueous section	137	20	.....
Excavating river to grade	12	311	78
Driving steel sheetpiling	160	66	.....
Backfilling river section	.....	130	.....
Dismantling pontoons	128	16	17
Total Time	1,637	670	95

FIG. 4—PONTOON ASSEMBLY in position ready for lowering of subaqueous section. Hand-operated winches, working in pairs, lowered the pipe line to grade.

couplings and bulkheads, weighed approximately 175 tons, and when afloat drew on an average 30 in. of water. It was very easily handled by ropes in the hands of two or three men.

When soundings indicated the excavation had reached grade, the assembly was floated to place and the pontoons anchored securely. Then with each winch manned, the lowering of the subaqueous section was begun by revolving in unison each winch handle, according to signal. This gradual lowering was continued until the upper ends of the two bank elbows were near the water surface when the remaining two elbows were attached with Dresser couplings reinforced with 1x22-in. anchor bolts. Lowering operations were then resumed with the two upper elbows held against overturning by lines to the cranes on each bank. To overcome buoyancy as the pipe neared grade and to aid in holding the elbows in an upright position, water was pumped into the subaqueous section until the entire line rested solidly on grade.

The left bank end of the subaqueous section was placed accurately to line, grade and station, but the bank end came to rest 3 in. above grade and about 4 in. short in distance, due either to material running into the trench while lowering was in progress or a movement at the joint in the lower elbow. However, this was acceptable, as an adjustment for height and distance had been provided for in the closure piece on the right bank.

An 8-in. blowoff line, located at the right bank end or the lowest point of the subaqueous section and leading to valve chamber, was made up of wrought-iron pipe, with flanged and welded connections. A sufficient length to reach above water surface was attached to the subaqueous section before it was lowered.

The pontoons were detached from the subaqueous section at grade by releasing the ends of supporting cables from the winches on one side and drawing the cable through by winding the opposite winches. The pontoons were then taken back upstream to the original point of assembly and disconnected. All of the sections of pipe, as well as the couplings, were used at other points in the line. All other material in the pontoons was salvaged and also used elsewhere. The remainder of the 6-in. concrete coating, specified on those sections not covered in the bank assembly, was placed under water by tremie and above water with wooden forms. Actual time engaged in placing the subaqueous section is given in the tabulation.

The job was carried out for the city of Fort Wayne by John Dehner, Inc., Fort Wayne, contractor. The writer, associated with the contractor, originated and designed the method of placing the subaqueous section. The writer feels that if the job were to be repeated, improvements in details could probably be made, principally in handling the excavation, but as a whole the project was highly successful.

Data on Structural Use of Plywood from Two New Test Series

As a covering for frame walls and as the subfloor and ceiling of floor panels, it contributes improved strength and stiffness and furnishes opportunities for prefabrication of these units of a building

By George W. Trayer
Senior Engineer, Forest Products Laboratory, Madison, Wis.

TWO SERIES of tests completed this year at the Forest Products Laboratory furnish new data on the use of plywood, particularly from a structural viewpoint. In the first tests the action of plywood when utilized as a structural covering for frame walls and wall units was studied, while the second investigation covered floor panels with stressed plywood coverings.

The results of both tests are significant. Briefly, for wall units, well-nailed plywood in large sheets was shown to contribute strength and rigidity comparable to that obtainable with diagonal lumber sheathing and much greater than that obtained with horizontal sheathing. By gluing the plywood instead of nailing it, strength and rigidity may be increased enormously.

In the floor-panel tests unusual advantages were demonstrated for units using plywood nailed and glued to the top of the joists as a subfloor and to the bottom of the joists as a ceiling. Such construction permits the plywood to contribute to the flexural strength of the floor system, and in effect reproduces the action of a box girder. Shallower joists are permissible, and greater stiffness and strength are obtainable with stressed plywod coverings.

* * *

I—Plywood as a Structural Covering for Frame Walls and Wall Units

SEVERAL YEARS AGO a series of tests was made at the Forest Products Laboratory to determine the relative resistance of different types of frame-wall construction to static loads applied in the plane of the panels (*ENR*, Oct. 24, 1929, p. 656). The purpose of the tests here reported, which were planned to supplement the earlier tests, was to determine the extent to which plywood can impart strength and stiffness to a wall, to show the relation between the method of fastening (nailing and gluing) the sheet to the frame and the amount of inherent stiffness and strength utilized, and to get a measure of the performance of small units that appeared to offer possibilities from the fabrication and assembly standpoint.

Test panels and procedure

All test panels were 8 ft. high by 12 ft. long. They were either a single unit of those dimensions or an assembly of three separate units each 8x4 ft. The framing material was southern yellow pine, and the plywood that was attached to the frame, both by nailing and by gluing, was douglas fir, sanded two sides, in sheets 4x8 ft. Panels made as a single unit consisted of 2x4-in. upper and lower plates, three-piece end posts, and 2x4-in. studs spaced 16 in., the whole being covered on one side with plywood and the other side left open. The end posts were built of two 2x4-in. pieces spaced ⅜ in. apart, to which a third 2x4 was nailed with its 4-in. side perpendicular to the 4-in. sides of the other two. One of the panels was framed as for a double 26x28-in. window, and two were framed for a double 26x28-in. window and a 2-ft. 8-in. x 6-ft. 8-in. door. Two 16d nails were driven through the upper and lower plates into the ends of the studs.

The tests were devised to show the resistance of the various panels to static loads applied to the upper plates and acting horizontally in the plane of the panel, as shown in Fig. 1. The machine arrangement and attachments were the same as those described in the earlier article (*ENR*, Oct. 24, 1929).

Movement under load was measured in two ways, first by determining the differences in the horizontal displacements of the upper and lower plates, and second by measuring the change in length of both diagonal dimensions of the panel and then converting the readings into horizontal displacement. Errors of variable magnitude are introduced by the first method because any rocking over of the panel as a whole is included in the movement of the upper plate. Some yielding at the lower right-hand corner of the panel (Fig. 1) and also in and at the hold-down rods is inevitable. If the movement of the plate for a given increment of load were large, the increment due to rocking of the panel would introduce an error of minor magnitude, whereas in an inherently rigid panel the error introduced would be of considerable importance. The second method was used when the sheathing material was glued

RIGIDITY AND STRENGTH OF WALL PANELS, WITH VARIOUS FORMS OF SHEATHING, EXPRESSED AS RATIOS OF CORRESPONDING CHARACTERISTICS FOR HORIZONTAL SHEATHING[1]

Panel	Description: Type	Description: Sheathing	Nails: Size (d)	Nails: Spacing[2] (In.)	Distortion by	Rigidity factor at slip in inches of: 0.1	0.2	0.3	0.4	0.6	0.8	1.0	Maximum Load Factor
P1	Full panel	⅜-in. plywood	8	6	Plate movement	2.6	3.6	3.9	4.4	5.1	5.7	6.5	over 9[3]
P1A	" "	¼-in. plywood[4]			Diagonal measurement	24.6[5]							over 9
P2	" "	⅜-in. plywood	6	5	Plate movement	2.9	3.4	3.7	4.0	4.3	4.5	4.8	5.2
P2A	" "	⅜-in. plywood	6	2½	Plate movement	4.5	5.2	5.5	5.9	6.5	6.8	7.2	7.0
P2B	" "	⅜-in. plywood			Diagonal measurement	8.8	11.0	12.9	14.4[6]				8.6
P3	Window opening	⅜-in. plywood	6	5	Plate movement	2.2	3.1	3.3	3.4	3.7	3.8	4.0	3.7
P4	Window and door openings	⅜-in. plywood	6	5	Plate movement	1.4	1.7	1.6	1.8	2.1	2.2	2.3	2.8
P5	Window and door openings	¼-in. plywood[4]			Diagonal measurement	1.9	2.6	2.8	3.3	4.0	4.0	4.3	4.0
P6	Three-unit	Horizontal	8		Plate movement	1.1	0.9	1.6	1.2	1.3	1.6	1.8	2.2
P7	" "	⅜-in. plywood		5	Plate movement	1.5	3.0	4.1	4.4	5.9	5.2	5.8	6.2

[1] The rigidity and strength afforded by southern yellow pine boards 8 in. wide, laid horizontally, and nailed to southern yellow pine framing with two 8d common wire nails at each stud crossing, are both taken as unity.
[2] The nail spacing indicated is that around the four edges of each plywood sheet. The pacing at intermediate studs was double that given in the table.
[3] Test stopped at 21,000 lb.
[4] Glued to frame.
[5] Reading stopped at 0.12 in.
[6] Readings stopped at 0.56 in.

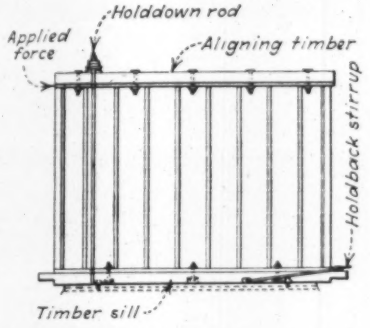


FIG. 1—WALL-TEST PANEL, 8 ft. high by 12 ft. long, showing method of applying load.

to the frame; because of local distortions, particularly at the corners, it was not feasible to use it for the nailed panels.

Results of panel tests

The results of ten tests, all but one on plywood panels, are shown in the accompanying table. In order to get an easy comparison between the various forms of wall construction, the rigidity and strength of a panel sheathed horizontally with 8-in. southern yellow pine boards nailed with two 8d nails at each stud were each taken as unity. This same scheme was used in the earlier investigation. The maximum load for 9x14-ft. panels sheathed horizontally with lumber, as determined by the previous tests, was 2,588 lb. This would correspond to 2,218 lb. for an 8x12-ft. panel. The tests of the plywood panels were stopped at 21,000 lb. if the maximum load had not been reached before that point.

It will be observed that the rigidity factors for the plywood panels, as given in the table, are not constant but that they increase as the movement of the upper plate increases. In other words, the general form of the load-slip curve for a panel sheathed with plywood is not the same as that for a panel sheathed horizontally with lumber. The variation seen in the rigidity and strength of the lumber-sheathed 3-unit panel (P6 in the table) is due to structural modifications, as is explained later.

Nailed Plywood Panels Without Openings—Well-nailed plywood sheathing gives a rigidity to a wood frame without openings several times that afforded by horizontal sheathing. Its effect is in fact comparable with that of diagonal sheathing. The ⅜-in. plywood, panel P1, was nailed with 8d common wire nails spaced 6 in. apart around the edges of the plywood sheets and 12 in. on intermediate studs. The ¼-in. plywood, panel P2, was nailed with 6d nails spaced 5 in. around the edges of the plywood sheets and 10 in. on intermediate studs. It has been shown in other tests that the proportional limit load of a nail in lateral resistance varies as the 3/2 power of its diameter. Hence an indication of the relative rigidity of panels P1 and P2 at small distortions, before any appreciable deformation of the plywood occurred, can be obtained by taking into account only the difference in nail diameters and number of nails thus:

$$\frac{5}{6}\left(\frac{0.131}{0.113}\right)^{3/2} = 1.04$$

Examination of the table will show that at slips of 0.2 and 0.3 in., panel P1 was about 5 per cent stiffer than panel P2. As the slips increased, the superiority of the ⅜-in. plywood increased, until at a 1-in. slip it was about 35 per cent better.

No exact comparison of the ultimate loads is possible, because the test was stopped before the maximum load of the ⅜-in. plywood panel was reached. The maximum load for ¼-in. plywood was more than five times that for horizontal sheathing but less than that obtained with diagonal sheathing, whereas the ⅜-in. plywood showed a strength factor above 9, which equals the best performance of diagonal sheathing.

The results for panel P2A show the effect of adding more nails. As indicated in the table, twice as many nails were used for this panel as for panel P2. The increase in stiffness was approximately 50 per cent. A tendency of the plywood to buckle appeared to be the most important factor in preventing a further increase. No panel can be assumed to form a geometrically plane surface, and under load there would necessarily be some buckling, which would tend to increase under the greater loads made possible by additional nailing. (The pronounced increase in rigidity obtained by gluing will be shown later.)

Nailed Plywood Panels With Openings—When a double 26x28-in. window opening was framed into an 8x12-ft. panel (P3) the stiffness, with ¼-in. plywood nailed to the studs, was less than that for a panel without openings. The reduction varied from about 10 per cent for small distortions to about 20 per cent for large distortions. Nevertheless for movements of the upper plate greater than 0.1 in. the rigidity factor remained greater than 3. As a basis of comparison, the rigidity factor for a diagonally sheathed 9x14-ft. panel with a double 28x28-in. window opening was reduced from about 4 to 3. The maximum load with plywood sheathing was, however, 25 per cent less than that obtained with diagonal sheathing.

When a double 26x28-in. window and a 2-ft. 8-in. x 6-ft. 8-in. door were framed into the panel (P4), the stiffness, with ¼-in. plywood, was further reduced to about one-half that for a panel similarly sheathed but without openings. By the former tests it was found that the rigidity factor for a diagonally sheathed 9x14-ft. panel with a double 28x28-in. window and a 3x7-ft. door averaged about 1.2. The rigidity factors given for panel P4 are all greater than this. However, it was found in the previous tests that the tendency of diagonal sheathing to distort the framing around windows and doors was greatly reduced when siding was added. With the additional triangulation supplied by the siding, slightly greater stiffness was obtained with diagonal sheathing than with ¼-in. plywood. It is not expected that the addition of siding to the plywood sheathing would have any material effect upon its rigidity. The ultimate strength with plywood sheathing was about the same as that obtained with diagonal sheathing without siding and

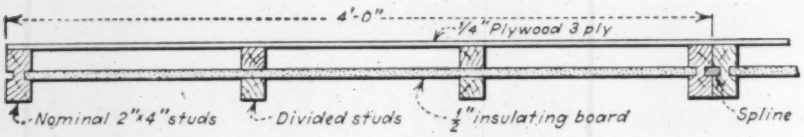


FIG. 2—PLYWOOD FACING and an inserted insulating board as used on the 4-ft.-wide panels. Three such panels were assembled into an 8x12-ft. test piece by means of the splines that were glued into the studs.

about one-third less than for diagonal sheathing with siding.

Glued Plywood Panels Without Openings—Gluing the plywood to the studs greatly increased the rigidity of the panels. While failure to obtain readings for panel P1A at distortions larger than 0.1 in. makes it impossible to compare the performance of ¼-in. and ⅜-in. plywood when glued to the studs, it may be stated that, in comparison with nailing, the increase in rigidity obtained by gluing is enormous and that the inherent rigidity of either thickness is not even approached with normal nailing. Comparison of the various forms of nailing and of gluing shows conclusively that the inherent rigidity of the plywood sheet is developed only in a measure commensurate with the adequacy of its attachment to the frame.

Glued Plywood Panels With Openings—Comparison of the results for panels P4 and P5, both of which had a window and door, the former having ¼-in. plywood nailed to the studs and the latter glued, show an increase in rigidity with gluing of some 36 per cent for small distortions up to about 100 per cent for large distortions. Again the importance of secure attachment of the plywood to the panel frame is apparent.

Fabricated wall units

The 4x8-ft. units, three of which were assembled and tested in an 8x12-ft. panel, were made in two styles—with plywood and with horizontal lumber sheathing. Fig. 2 is a horizontal section of these units showing plywood attached to the studs. The 2x4-in. top and bottom plates were slotted to receive a sheet of ½-in. insulating board, and one 10d cement-coated nail was driven through the plates into each divided stud. Four 10d cement-coated nails driven from one side and three from the other tied each pair of divided studs together. The spline shown, where two units joined, was set in casein glue, and the end studs were held snug with six 16d common nails while the glue set. Horizontal sheathing was of nominal 8-in. width, and each board was attached to the frame with two 8d common nails at each stud crossing. The inside face of all the units, which in actual use would have some form of plaster, wall board or other covering, was left open in test.

The horizontally sheathed assembled panel is numbered P6 in the table. Its performance at small distortions was the same as that of a large panel constructed with one-piece upper and lower plates, 2x4-in. studs spaced 16 in., and 8-in. continuous horizontal sheathing. At larger distortions the insulating board came into bearing against the upper and lower plate of each unit. The result of this extra bearing was a stiffness factor greater than unity at the larger distortions.

Panel P7 consisted of three 8x4-ft. units with ¼-in. plywood sheathing nailed to the outside face with 6d common wire nails. The spacing was 5 in. around the edges of the 4x8-ft. plywood sheets and 10 in. at intermediate studs. The performance of this panel was slightly superior to that of panel P2, which had the same type of sheathing nailed in the same way but to an integral frame as described. The 10 to 20 per cent superiority in stiffness is at least partly accounted for by the fact that the insulating board in the three units came into bearing, as in the preceding case. There was also some slight advantage in the nailing at the vertical edges where the units come together, because the double studs at these points permitted nailing farther from the edges of the plywood sheets.

In order that the rigidity of a panel made up of several units sheathed with plywood or other relatively rigid covering may be made equal to the rigidity of an integral panel similarly sheathed it is necessary to have a rigid connection between the units. The glued spline connection used in the tests was devised in the interest of a structurally rigid joint, but other types than glued connections may prove sufficiently rigid in practice.

Conclusions

The limited number of tests in this particular series precludes definite numerical comparison of different types of wall construction. However, by virtue of the results from a related series previously obtained and the broader general aspects of our knowledge concerning the performance of wood and wood fastenings, certain general conclusions are warranted.

Plywood in large sheets, ¼ in. or more in thickness, well nailed to a frame wall affords several times the rigidity and strength that is afforded by horizontal sheathing. In this respect it compares favorably with diagonal sheathing.

The extent to which the inherent rigidity and strength of large plywood sheets are utilized depends upon the security with which the plywood is attached to the frame. By gluing, a rigidity is obtained that is far superior to anything possible with nailing, whether plywood or diagonal sheathing is used.

Wall units of convenient size for factory fabrication and easy erection can be assembled with glued splines in such a way that in rigidity and strength they are fully equal to that of similarly sheathed large wall panels framed in the conventional manner.

II—Stressed Plywood Coverings for Floor Panels Tested

INCREASING INTEREST in factory-fabricated building units led to this series of tests on wood-floor panels in which the principle of stressed covering is embodied. The panels tested consisted of relatively shallow joists, to the top of which plywood (suitable for a subfloor) was nailed and glued, and to the bottom of which thinner plywood (to serve as a ceiling in lieu of plaster) was also nailed and glued.

The stressed covering

In the ordinary floor system of relatively deep joist overlaid with a subfloor of nailed boards that carry the finished floor, the subflooring serves to distribute the floor load to the various joists, making possible the laying of a relatively thin finish-floor. When laid diagonally, the subfloor also stiffens the building. Aside from these structural functions it serves as a working surface during construction, assists in deadening sound, prevents dust from rising from the basement to the first floor, and adds to the insulation of the room. It contributes nothing, however, to the bending strength of the joists. Ceilings hung on the floor joists are parasites so far as bending strength of the entire floor system is concerned.

In contrast to the conventional sub-

DIMENSIONS AND PERFORMANCE CHARACTERISTICS OF 14-FT. FLOOR PANELS WITH STRESSED PLYWOOD COVERINGS

(Span 13 ft. 6 in.; third-point loading)

Panel	Width, In.	Thickness of 5-Ply Top, In.	Thickness of 3-Ply Bottom, In.	Joists: Number	Joists: Size, In.	Direction of Face Grain of Plywood[1]: Top	Direction of Face Grain of Plywood[1]: Bottom	Moment of Inertia of Panel Section,[2] In.[4]	Moment of Inertia of Joists,[3] In.[4]	Modulus of Elasticity of Joists, Lb. per Sq.In.	Maximum Load, Lb.	Equivalent Load if Uniformly Distributed, Lb. per Sq.Ft.	EI from Test,[4]	Modulus of Elasticity from Test,[5] Lb. per Sq.In.	Working Deflection,[6] In.	Maximum Stress in Extreme Fiber Lb. per Sq.In.
A	24	5/8	1/4	2	1 1/2 by 5 1/2	Parallel	Parallel	136.7	42.5	1,470,000	6,210	325	227,000,000	1,660,000	0.32	4,150
				1	1 1/2 by 5 1/2											
B	24	5/8	1/4	2	1 1/2 by 5 1/2	Perpendicular	"	126.0	42.1	2,080,000	10,200	504	226,700,000	1,799,000	.35	7,040
				1	1 1/2 by 5 1/2											
C and D[7]	48	5/8	1/4	4	1 1/2 by 5 1/2	"	"	262.4	82.8	1,870,000	14,320	354	444,000,000	1,692,000	.33	4,950
				2	1 1/2 by 5 1/2											
E	48	5/8	1/4	3	1 1/2 by 5 1/2	"	"	241.2	64.2	1,887,000	12,300	304	393,000,000	1,628,000	.36	4,650
F[8]	48	5/8	1/4	3	1 1/2 by 5 1/2	"	"	236.6	61.1	1,687,000	11,580	286	342,800,000	1,449,000	.37	4,450
G[8]	48	5/8	1/4	3	1 1/2 by 5 1/2	"	"	206.0	61.6	2,087,000	12,780	315	344,500,000	1,673,000	.43	5,260
H[8]	48	5/8	1/4	3	1 1/2 by 5 1/2	"	"	226.1	61.6	2,285,000	13,600	336	342,800,000	1,516,000	.39	4,950
I[8]	48	5/8	1/4	4	1 1/2 by 5 1/2	"	"	197.5	42.3	2,382,000	12,800	316	333,500,000	1,689,000	.44	5,370
J	24	5/8	.....	2	1 1/2 by 5 1/2	Parallel	.....	88.6	42.3	1,846,000	6,570	324	160,500,000	1,815,000	.50	6,320
				1	1 1/2 by 5 1/2											

[1]Parallel and perpendicular refer to direction of grain with respect to the length of the panel.

[2]In calculating the moment of inertia of the panel sections the plies of the coverings that ran at right angles to the length were neglected. The calculations are based on actual dimensions of the joist and ply thicknesses.

[3]The moments of inertia of the joists are about their own neutral axis.

[4]EI is the product of the modulus of elasticity and moment of inertia.

[5]The modulus of elasticity in this column is the EI from test divided by the calculated moment of inertia.

[6]Based on 40 lbs. per sq.ft. live load and 7 lb. per sq.ft. dead load for panel and finish floor, a span of 13 ft. 6 in., a modulus of elasticity of 1,600,000 lbs. per sq.in., and the calculated moment of inertia given in the table. A deflection limited to 1/360 of the span would be 0.45 in.

[7]Panels C and D, each 24 in. wide with 3 joists, were tested together.

[8]Spacer blocks in ends.

floor and ceiling, stressed coverings are those which contribute to the flexural strength of the floor system. They must be rigidly attached to the upper and lower surfaces of the joists, as with glue, so that by virtue of the resistance to shear of the surfaces between the joists and the coverings, the upper covering is thrown into compression and the lower one into tension. Plywood serves admirably for such coverings. The sheet on top should be sufficiently thick to perform the usual functions of the subfloor, while that on the bottom, which serves as a ceiling, need not be so thick.

A floor panel consisting of plywood glued to the upper and lower surfaces of several joists laid parallel to each other is in effect a box girder. The purpose of the tests described here was to determine the rigidity and strength of such girders.

Design of floor panels

The test panels were 14 ft. long and either 2 or 4 ft. wide. The joists, which were southern yellow pine, were 5⅞ in. deep, net dimension. Douglas fir plywood was nailed and glued to the top and bottom surfaces of the joists. Casein glue was spread on these surfaces, but no pressure was applied during the setting of the glue except that provided by 6d common nails spaced 6 in. on top and 6d finishing nails spaced 3 in. on the bottom. The joist thicknesses and spacing, plywood thicknesses and direction of face grain, and the panel widths are given in the accompanying table.

A single panel, 2 ft. wide, with plywood attached only to the upper surface of the joists was also tested, to demonstrate the inadequacy of such construction.

The panels were tested over a span of 13½ ft. with load applied at the third points (Fig. 3). The loading device descended at the rate of 0.4 in. per min., and deflections were read to the nearest 0.01 in. for each increment of 200 lb. of load for the 2-ft. panels and 400 lb. for the 4-ft. panels. Control specimens cut from the joists were tested in accordance with standard procedure, to determine their strength properties.

Test results

In addition to a further description of the test panels and their dimensions the table gives the calculated moments of inertia of the test panels, their strength characteristics as determined by test, and deflections calculated on the basis of a 40 lb. per sq.ft. live load and 7 lb. per sq.ft. dead load of the panels and finish floor.

In calculating the moment of inertia of a panel section, those plies whose grain ran perpendicular to the length of the panel were neglected. It is to be observed in this connection that in 5-ply, ⅝-in. plywood, for example, each ply is not necessarily ⅛ in. thick, it being present practice to use various combinations of veneer thicknesses to produce given thicknesses of plywood. Furthermore, when the plywood sheet is removed from the press it is usually over the finished thickness to permit sanding of the face plies. All plywood used in these tests was sanded on both sides.

Panels A, B, C and D (Fig. 4) were 2 ft. wide, with 5-ply ⅝-in. plywood on top and 3-ply ¼-in. plywood on the bottom. As indicated in the table, the grain of the face plies on the top of panel A ran parallel to the length of the panel; in all other panels except panel

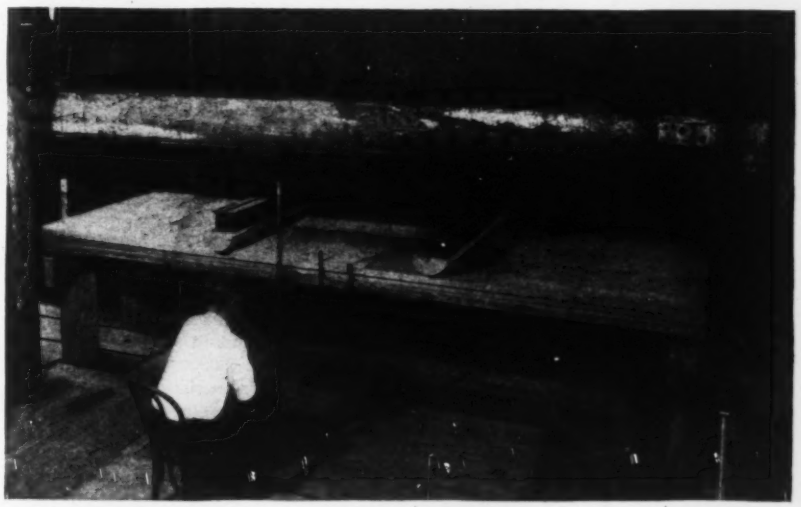


FIG. 3—FLOOR PANEL, with stressed plywood covering, top and bottom of shallow floor joists, being tested under third-point loading.

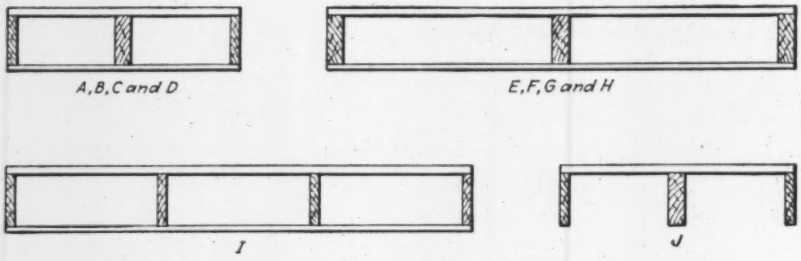


FIG. 4—TYPES of floor panels with stressed plywood top and bottom, which were studied in the investigation.

J it ran perpendicular to the length. The grain of the face plies of the bottom plywood was laid parallel to the length of all panels except panel J which had no plywood on the bottom.

Panels A, B, C and D each had three joists, the outside ones 13/16 in. thick, the center one 1⅝ in. thick. A and B were tested individually, C and D together. Their maximum strength ranged from 300 to 500 lb. per sq.ft. when adjusted to the basis of a uniformly distributed load. For a 13½-ft. span they averaged 32 per cent better in stiffness under a 40 lb. per sq.ft. live load and a 7 lb. per sq.ft. dead load than the requirement limiting the deflection to 1/360 of the span (0.45-in. deflection). Attention is directed to the fact that panels C and D were tested together, and the moment of inertia, maximum load and similar information in the table are for the two panels.

Panel E represents an attempt to reduce the amount of material in the joists. This panel was 4 ft. wide and had three joists each 1⅝ in. thick, or 25 per cent less material in the joists than in the first four panels for an equivalent width. Panel F was identical with panel E except that 1x4-in. spacer bars were inserted in each end to reduce such buckling of the bottom plywood as is illustrated in Fig. 5. Both of the panels were sufficiently strong and averaged about 23 per cent stiffer than the requirement already mentioned. The drop from 32 to 23 per cent excess in stiffness is a direct reflection of the reduction in moment of inertia of the joists.

Fig. 5, as already mentioned, shows the buckling of the lower plywood of panel E at maximum load. Incidentally, this buckling was very slight at safe loads. The tensile forces passing out from the joist to the thin lower plywood have components which tend to draw the lower edges of the joists together and buckle the plywood. In fact, in panel E this force was so great at maximum load that the glue lines between the upper plywood and the outside joists were broken. Even with spacer blocks at the ends, these buckling forces were sufficiently great to buckle the lower plywood at the center of the length of the panel. At maximum load the concavity of the lower surface in this region was decidedly noticeable.

In panel G the upper plywood was reduced from ⅝ to ½ in. with the lower plywood ¼ in. as before. The stiffness was reduced about 18 per cent below that of panels E and F, but was still about 5 per cent above the stiffness requirement already mentioned.

In panel H, ½-in. plywood was again used on top but with ⅜-in. plywood on the bottom. The stiffness was brought well within the required limits but not quite equal to that of panels E and F. The breaking strength, however, was greater than for either E or F. The core thickness of the ⅜-in. plywood was almost 60 per cent greater than that of the face plies, while in the ¼-in. plywood the core was about 25 per cent thicker. Therefore, the net result of taking ⅛ in. in thickness off the top plywood and putting it on the bottom was a slight loss in moment of inertia, which is reflected in the stiffness.

As a final step, panel I was made with four joists each 13/16 in. thick, a reduction in joist area of ⅓ below that of panel H. The top plywood was ½ in. thick, and that on the bottom ⅜ in. thick, as for panel H. The breaking strength of this panel is considered satisfactory, but it is just on the border line of acceptability as regards stiffness. The reduction in stiffness below that of panel H is a reflection of the loss in moment of inertia occasioned by the reduction of material in the joists.

In order to demonstrate the inefficiency of a section with plywood on the top surfaces of the joists only, panel J was made identical with panel A except for the omission of the lower plywood. While its strength characteristics may be considered satisfactory, its stiffness was only about two-thirds that of panel A.

It appears from these tests that floor panels made with stressed top and bottom coverings, such as with plywood glued to the joists to form a box girder, can be made with satisfactory strength and stiffness.

For a panel length of 14 ft. a joist height of 5⅞ in. appears suitable, which means an appreciable reduction in the thickness of the floor system aside from any consideration of less material and labor costs.

FIG. 5—BUCKLING of the ceiling board on floor panel E at maximum load. At safe loads this buckling was also noticeable but inappreciable.

In order to obtain sufficient stiffness in panels over 14 ft. in length, a joist depth greater than 5⅞ in. or thicker plywood than that used in the tests would be required, although the former would furnish the added stiffness with less material.

The stiffness of floor panels made in the fashion described can be calculated with reasonable accuracy by neglecting the plies of the coverings that run at right angles to the length and by using 5/6 of the modulus of elasticity for the wood of which the plywood is made, based on corresponding moisture-content values.

In calculating the maximum strength of girder-type floor panels, it should be observed that the average extreme fiber stress given in the table is slightly less than one-half the modulus of rupture for clear douglas fir wood at a corresponding moisture content.

Power-Elevator Data

A survey of the total number of power elevators in 166 representative cities throughout the country, including all of the larger metropolitan areas, gives a figure of 196,379 installations. The Manhattan Island section of Greater New York leads with 25,824 elevators, according to this survey made by the Otis Elevator Co.

Cities having more than 2,500 power-elevator installations are:

Manhattan	25,824	Brooklyn	3,917
Chicago	11,277	Cleveland	3,608
Philadelphia	9,400	Pittsburgh	2,958
Boston	9,114	Baltimore	2,905
San Francisco	6,483	Providence, R. I.	2,735
Detroit	5,301	Washington, D. C.	2,722
Los Angeles	4,965	Indianapolis	2,670
St. Louis	4,288	Newark, N. J.	2,544
Bronx (New York City)	4,151		

Engineering Analysis of Five-Year Plans for Russian Rehabilitation

I—Economic and Technical Obstacles

Conditions on which success of the first five-year plan was predicated were not realized and actual accomplishment fell far short of that planned

By Zara Witkin
Consulting Engineer, Oakland, Calif.

THE FIVE-YEAR PLANS for reorganizing the economic life of Russia by a gigantic construction program are the most spectacular attempts ever made to mobilize a nation's resources for civic and industrial betterment. Its social-economic aspects have been discussed in dozens of books and scores of magazine articles. Few of these writers have had the training in engineering analysis that would direct their attention to the technical-economic aspects or would lend authority to their consideration of this phase of the great Soviet activity. The present article and two others to follow are distinctive in the respects, first, that they confine discussion to the engineering-construction operations and, second, that they express the determinations of an engineer expert in American methods who was engaged by the Soviet government as a consultant in carrying out parts of its construction program. —EDITOR.

THE unprecedented construction program of the first five-year plan of the Soviet Union, officially pronounced complete in January, 1933, mobilized all the material and human resources of the nation and subordinated all other activities except national defense. Intimately interwoven with the social-economic philosophy of the Soviet government, the profound political effect of the plan has been felt all over the world. This phase has been fully dealt with in many foreign articles and books and in the official pronouncements of the Communist Party leaders. The technical-economic methods of the five-year plan, however, its engineering and managerial elements, have remained comparatively obscure, although these formed the foundation for the social structure and determined the degree of its success or failure. It is of paramount importance that they be truly appraised.

Scope of plan enormous

The first five-year plan of construction was an aggregation of extensive industrial and military enterprises, electrification projects, highway, waterway and railway-transport developments, municipal utilities and housing, with primary emphasis on heavy-industry producing machines and basic materials for light, consumer-goods industries. The Soviet conception of the aim of the plan was stated by the state planning commission as follows:

"The plan involves the radical reconstruction of the productive system of the country and a decisive increase in its mechanical and electrical resources as a means of industrialization and socialization. The plan will be a tremendous test of the technical and organizational resources of the Soviet Union. This test can and will be met in a fitting manner only on condition that all the prerequisites for carrying out the development program be thoroughly studied and fulfilled within the limits of practical possibilities. * * * It cannot be expected that any economic plan will be completely carried out with absolute precision and without deviation in any direction, especially when the plan is drawn for a considerable period ahead and embraces the entire economic life of a country as large as the Soviet Union, with all the complex interplay of the most varied economic factors."

The state planning commission further stated the fundamental conditions which would decide the outcome as follows:

The state planning commission assumes the necessity of preparing the five-year national economic plan in two variants. The maximum variant is based upon:

1. The absence of any serious crop failure during the course of the five-year plan.
2. Considerably broader economic ties with world economic life as a result of the existence of greater export resources within the country.
3. A sharp improvement in the qualitative indices in economic development during the next two years, such as cost of production, harvest yield, etc.
4. A smaller relative weight of expenditures on defense in the general economic system.

The difference between the maximum and minimum variant is 20 per cent, approximately a year's period of development.

The responsible leaders who formulated the plans thus clearly realized the tasks and the difficulties and requirements of their execution. In the first flush of apparent early success, however, this caution and foresight were forgotten, and the necessary conditions for accomplishment were obscured in a great wave of enthusiasm. Reality, however, assumed serious adverse forms in many phases of the internal and international situation, changing and limiting the construction program.

Economic obstacles

In 1931 drought in the Volga region caused a crop shortage. Also the international financial crisis assumed graver proportions than were expected, and the prices of raw commodities, such as Russia had available for export in payment for imported machinery, dropped disastrously. (Of course the price of the equipment also dropped but not in proportion.) This had several critical effects: first, the export of commodities and food was greatly increased, leaving much less for home consumption, seriously reducing the efficiency of the population; second, more gold was expended to balance foreign trade, and finally and most significantly, the purchase of machinery and tools, the very heart of the new industrialized construction, was forcibly reduced to the lowest possible requirement.

In 1931 the threat of war in the Far East arose and caused the dispatch of troops, food and military supplies, which put a back-breaking additional burden on the already overloaded railway transportation system. Even more important, many industrial plants were hastily converted for the manufacture of military weapons and equipment. To this factor, Stalin in January, 1933, ascribed the greatest influence in the failure fully to complete the plan.

Anticipation of increased harvest yield and lowered costs of production, with greater productivity, also met with disappointment.

The nebulous statistico-arithmetical method of general planning showed a

continued serious inability to "face reality, incorporate clear technical ideas and adjust plans to material possibilities." This persisted until Premier Molotov, at the beginning of the final year of the plan, announced the planned increase in production for the year to be 36 per cent. At the end of the year, in summarizing its achievements, he stated the actual increase as 8.5 per cent —i.e., only one-quarter of the planned amount.

Technical obstacles

In the more specific requirements of the various phases of the work itself, formidable obstacles were encountered. The state planning commission had stressed the vital need of introducing the latest technique through the medium of foreign expert aid.

In 1929-'30 there were 2,950 foreign specialists in the Soviet Union. In 1930-'31 there were 4,140 with amounts of 18 and 38 million rubles, respectively, paid for their services and also to skilled foreign labor in those years. A total of 150,000,000 rubles was planned to be spent during the five-year period for foreign technical aid. This was probably the most profitable investment of the five-year plan for the Soviet Union. The savings resulting from their improved methods and efficient designs, the increase in speed of work under their direction and the wastes which were prevented, while not precisely determinable, exceeded many times the aggregate salaries of the foreign experts.

But the problem of foreign expert aid was seriously mishandled. Inadequate interpreters were sometimes supplied, choking the effectiveness of the experts down to the capacity of the interpreter. Strange and unsatisfactory living and working conditions also crippled their efficiency and greatly lowered their output. Instead of fully assisting and utilizing this foreign engineering help for which many millions of rubles were expended, the general experience has been one of constant bureaucratic opposition, deadening delay and failure to cooperate in applying better methods. Foreign experts have been forced to fight in the Russian press, and to carry their cases for improvement against the opposition of their Russian colleagues to special investigating institutions, a process which is repugnant to professional engineers of high standing and which results in an increasingly lower grade of foreign engineers being employed in the Soviet Union. Quantitative appraisal here is difficult, but the efficiency of foreign engineers under these conditions has been destructively lowered and is but a fraction of their normal accomplishment.

Rationalization of the entire construction industry, foreseen as a basically required step, proceeded slowly and against extreme resistance and inertia. Antiquated methods existed and still remain in vogue, and improvements are obstructed and fought with the full weight of an inexperienced, technologically backward people steeped in obsolete habits. A serious tendency on the part of Russian engineers to consider technical proposals by foreign engineers as reflections on their national pride and personal scholastic attainments has also retarded the use of advanced technique. Viewing any actual project under construction illustrates the fact that rationalization, after five years of an unprecedented volume of Soviet construction, has not been measurably attained.

THE Russian experiment has failed or succeeded according to the base from which measurement is made. If the measurement is backward from the level of hoped-for attainment, the record is mediocre, as Mr. Witkin points out. Rationalization of the construction industry is far from achievement. In the materials field only 52 per cent of the planned cement production, 70 per cent of the brick, 63 per cent of the lumber and 57 per cent of the steel were produced. Labor turnover is large, poor tools and materials hamper progress, and leadership is not always intelligent. But if the comparison is made between the present state of industrialization and the existing condition at the beginning of the planning era, the progress must be set down as truly remarkable. Mr. Witkin's appraisal of the technical-economic phases of the program indicates how both of these viewpoints are tenable.

Materials production inadequate

Lowering of costs was to have been achieved by industrialization of production of building materials and the work of the building trades, and by the application of power to construction work. Only in the cement and steel divisions of materials production has there been a beginning of the application of large-scale methods. In lumber and brick this does not exist to an important degree. The use of power in construction has advanced slowly, power hoists and tools being scarce. In the meantime the total new electric-power capacity planned for the entire five-year period was 3,500,000 kw., while the amount actually built was 2,700,000 kw., or only 77 per cent. Construction suffered at least in this proportion. Not only was the planned power not produced, but even the amount produced was not fully utilized in construction operations.

The low skill of Russian construction labor and crafts was fully recognized by the state planning commission, which pointed out the primary necessity of training skilled workers. That this was not fully accomplished is disclo[sed] by the fact that the number of constr[uction] workers rose to a total of 2,900[,000] in 1932 instead of 1,900,000 as plann[ed] and yet performed less work tha[n the] smaller number was expected to [do].

Finally, in consideration of t[he] requirements for successful techni[cal] execution, we come to the produc[tion] of building materials. Here a definite quantitative measure can be applied. The production of basic construction materials in the final year 1932-'33 was to be as follows:

Cement, million bbl.	[illegible]
Brick, billions	[illegible]
Lumber and products, million cu.	[illegible]
Steel (ingots), millions of metric tons	[illegible]

Actually in the last year of the plan (1932) the production was as follows:

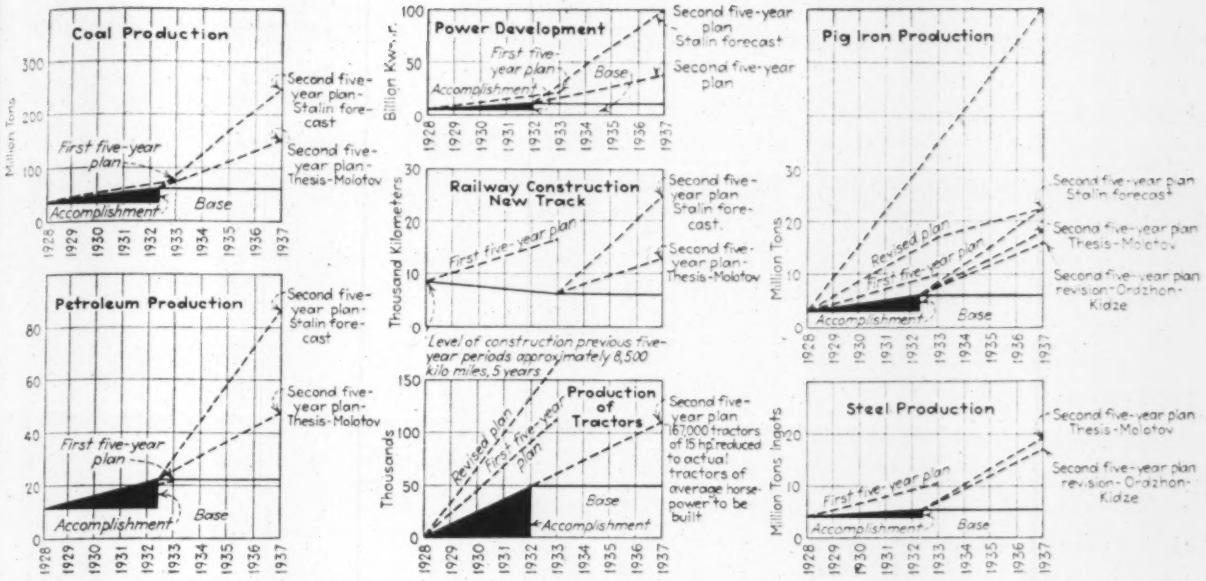
	Total	Per Cent of Plan
Cement, million bbl.	21	[illegible]
Brick, billions	6.5	[illegible]
Lumber and products, millions of cubic meters	27	[illegible]
Steel ingots, millions of metric tons	5.9	[illegible]
Average		[illegible]

Reduced construction inevitable

Manifestly the construction program could not be fully executed with so much less than the planned volume of building materials, in addition to the disorganization resulting from irregular transport and building schedules. To summarize, the fundamental requisites upon which the plan rested were not fully provided and in some cases disastrously neglected, while international conditions arose further to disrupt scheduled operations. The repercussions upon production of materials, design and construction methods were serious and disorganizing. A more detailed view of the construction work illustrates this.

The first result of the shortage in building materials during the period of the plan (about 30 per cent) forced a steady degradation of structures. Cement of uncertain strength and setting time, salmon brick and green lumber appeared to considerable extent in the general run of delivery, but there was no alternative to their use. Construction had to proceed. Anything available was used. The results are visible in the poor quality of the finished structures. Combinations of reinforced concrete, brick and, in some cases, wood, forced by material shortage, resulted in heterogeneous structures which time and stress will not treat kindly. Plans are frequently designed in offices thousands of miles from the site, which is never visited by the designers. Controlling local conditions are thus unknown and unprovided for, resulting in grave mistakes, confusion and waste.

Intimately connected with the materials supply was the materials transportation problem. So intense did this



PLANNED PRODUCTION of leading materials and services for construction according to first and second five-year plans of Soviet Union and production actually accomplished.

situation grow that in August, 1932, the commissariats of railways and of heavy industry opposed each other at a public debate held to decide responsibility for the acute shortage in both fields. The commissar of transport won the argument, but the conditions continued to grow worse in both branches until in January, 1933, Premier Molotov said: "We are far behind in the technical reconstruction of railroad and transport," and "Since August, 1932, the iron and steel industry has not improved, and the situation is absolutely intolerable. The program for 1933 repeats the unfulfilled one of 1932."

Haulage by truck is in a more serious state. So inefficiently are these units operated that for bulk materials the costs per ton-kilometer are in some cases twelve times as much as railway costs. The delivered prices of some heavy construction materials are approximately double the plant prices—i.e., the transport cost equals the production cost. Road conditions, which are extremely bad except in limited sections of the leading cities, play an important part in this high truck-haul cost and, combined with rough usage and neglect of mechanical care, contribute to the excessively short life of trucks. The heavy necessary amortization is reflected in costs of haul of over 3 rubles per ton-kilometer, which compares to about 3c. per ton-kilometer in the United States.

Poor tools and materials

The hampering effect of poor tools and materials was equally great; a few examples will make this statement plain. Typical laths are formed by hand splitting and have a cross-section $\frac{3}{32}$ x $\frac{7}{8}$ in. (but irregular) and are about 3 ft. long. These are woven into mats with diamond-shaped openings and tacked to studs. Occasionally the laths are individually tacked up. Gypsum, having been until recently unavailable, the familiar hard-wall plaster is absent. In its place are heavily over-sanded lime mixtures, weak and relatively harsh. Plasterers' tools are of poor design and manufacture, resulting in inferior work. Carpenters' tools also are of clumsy inefficient types, while many special tools are wholly lacking.

Such equipment as wheelbarrows is lacking, and loads are carried by two workers on wood trundles. Concrete mixers are lacking, plaster mixers are rare. Compressors are so scarce that the riveting on the Magnitogorsk blast furnace was held up, and special arrangements had to be made by one of the highest officials to send a few compressors from Moscow. Power hoists also are lacking, and even at Magnitogorsk, the greatest Soviet construction undertaking, the skid bridge of the first blast furnace (weighing about 80 tons) was riveted together on the ground and lifted as a whole by six gin poles with hundreds of men at the ropes.

Plastering the exterior of the Metropole Hotel in Moscow afforded another illustration of lack of equipment. The few pulleys, light cables and accessories to hand a swinging scaffold were not available. The work, therefore, was constructed by building solid scaffolding over the entire façade from the ground to the roof of heavy plank, sawed by hand from tree trunks brought to the site. The work took several months instead of a few days and wasted enormous amounts of labor, wood, nails and fasteners.

So elementary is the lumber industry in general as yet that plank, joists and beams are not regularly milled and stored for use, but logs are delivered to the job and there are sawed by hand into these elements. The staggering loss of time and lack of seasoning are heavy contributing causes to low productivity and poor results. Millwork is delivered in all kinds of weather without protection. The result is raising of the grain, warping, discoloration and waste in excess paint required.

Sand for concrete and mortar is customarily not washed. In transport, the equipment is forced to carry the useless amount of dirt, which may be at least 20 per cent of the total load.

Reinforcing steel is frequently exposed to the weather with consequent rusting and is rarely wire-brushed and never sand-blasted clean before use in the structure.

Formwork for reinforced concrete, although it has received considerable theoretical attention in lengthy reports, is, in practice, irrational and in some cases extremely wasteful.

Construction organization

Approximately one-quarter of the construction in heavy industry comes under the management and control of Soyuzstroi—the all-union construction trust. In explaining the functioning of this huge organization, the then acting-director Nemetz stated (1932):

"Included among other organizations in Soyuzstroi are 25 separate building trusts employing 320,00 men and expending 1,200,000,000 rubles annually (in the 1932 budget). Soyuzstroi has six main functions: it organizes trusts for construction; it makes general con-

tracts with various industries; it trains and supplies staffs for the trusts; it gives general technical direction and supervision; it develops general regulations for the construction industry; and it allocates equipment, engineers and materials. The extremely large projects such as the steel-coal combinats of Kuznetz and Magnitogorsk are separate organizations."

Besides this giant all-union trust there are several other national organizations—Standardzhilstroy (the standard housing trust), the commissariat of community economy directing construction of municipal buildings and utilities, the railway commissariat under whose direction railway structures are built, the commissariat of supply and others. Rapid formation of these great trusts, without precedent in Russia, lacking adequate staffs of experienced men, resulted in unwieldy and wasteful functioning, together with the growth of inefficient practices.

Construction is a continuous struggle against the elements, against faulty transportation, unskilled labor and crafts, poor and insufficient equipment, inadequate material and supply and quality. It can only be successfully controlled by a responsive central management able to meet the constant succession of emergencies characterizing every great project with speed and decision. This requires careful organization of office facilities and closely knit connections between all forces.

In contrast, in the typical Soviet construction trust, offices are badly arranged and extreme difficulty is encountered in locating desired men in authority. Telephones are not grouped through small main office exchanges but run individually with separate numbers to practically each man or room. With the drastic frequent changes of personnel, this creates great confusion, critically retarding progress of the work. Assistants are not trained to carry on the work of executives when these go away from their posts. The taking of messages for absent executives is practically unknown. These conditions make for extreme delay and great waste in operation. Expediting service, the heart of efficient, economical coordinated building, is practically non-existent. One step is taken, and then the next, with little consideration for future eventualities.

The conference habit of attempting to arrive at decisions is one which, in practice, is often converted to elocution instead of construction technique. Uniformly there are too many men in the meeting who usually do not study the problems under discussion beforehand. Their verbal contributions consequently are apt to be vague and oratorical.

Coordination between field and office is incomplete. Essential information is not transmitted and recorded. Much planning is done in ignorance of basic conditions and becomes fruitless effort. There is no standard procedure for planning work. Over and over again there are failures to begin with vital prerequisites on large construction such as roads, pure and adequate water supply, sewage disposal, power, transportation facilities, workers' housing and food supply. Terrible penalties have been paid for these conditions, which experienced management would have prevented, in the typhoid outbreak at Stalingrad, the great financial waste at Lake Balkhash, disorganization at Magnitogorsk, at Ishevsk and other critically important projects.

Construction is begun on many projects simultaneously with inadequate material supplies in prospect. They are then stopped for long periods, with enormous incidental waste involved in the capital and equipment and machinery thus unproductively frozen. This waste persists even in Moscow, the capital, under the full view of the authorities.

In other sectors of construction the condition is similar. For example, the railway construction trust, in its report for the year 1932, disclosed that it worked on 15,000 new and 25,000 reconstruction jobs. This astounding number, far exceeding the plan, consumed 82 per cent of the appropriations. Only 55 per cent of the plan for finished jobs had been carried out. The low percentage of completed construction was due to proceeding without regard to available material. Thousands of jobs were started and abandoned after they had consumed considerable quantities of material urgently needed for well-advanced work.

The unfinished jobs placed a heavy burden of millions of rubles of frozen capital upon the government. The chief of the finance department of the commissariat of railroads stated that on Jan. 1, 1931, 201,000,000 rubles were frozen in unfinished railroad construction, while 1932 increased this over one billion rubles.

Cost control

The fundamental basis of good construction management is accurate cost control. This is largely lacking in Soviet construction. The unit costs of work are practically unknown, and the pressure to lower costs is therefore too general to have much effect since the wastes cannot be definitely located.

To govern construction, general contracts are made which vary considerably in terms. No penalties exist, however, for exceeding the contract price or time of construction. The whole meaning of responsible contracting is therefore violated. Enormous wastages run uncorrected. The government has taken cognizance of this serious evil and has announced its decision to stress stricter fulfillment of contract obligations in the future.

Labor turnover

Hundreds of thousands of the construction workers were drawn from the agricultural fields. They were untrained in the use of tools. Large turnover contributed heavily to low efficiency and productivity. This turnover was due to hope for better pay on other jobs, inadequate provision for housing and food and payment of wages, and the wandering tendency of the population.

The vast complex program of development required the strongest, most efficient control by rationalization, standardization and coordination of work. Only by these measures could the required increase of productivity and lowering of cost have been achieved.

The second article, next week, will appraise the work accomplished in terms of its true magnitude, which show it to have been of moderate volume compared with construction in America.

Rail-Joint Welding Practice in Australia

MAKING RAILS in continuous lengths up to 160 ft. by welding the joints in the track is being practiced with satisfactory results on the South Australian Government Railways. With the rail ends at least $\frac{3}{8}$ in. apart the joint space is filled to the bottom of the railhead, the weld metal being built up above the railhead and then ground off level. Below this filling is a $\frac{3}{8}$-in. shim or filler plate as wide as the railhead and fillet-welded to the webs and the under side of the railheads. A base plate 6x$\frac{1}{2}$ in. and 30 in. long is fillet-welded to the edges of the rail base, the plate being a little wider than the rails. After the plates have been tack-welded in place, the rails are heated by a torch to about 180 deg. F. Then, working from the middle toward each end, the welding of the base plate is done in 3$\frac{1}{2}$-in. runs on each side alternately, so as to avoid excessive heating of the rail in any one spot.

In the design of this joint the aim was to develop the full strength of the rails under both static and dynamic conditions of loading. Thus the section of thickness of base plate is important, as it was found that with too thick a plate the joint would fail under test by the rail breaking near one end of the plate. In tests, with a $\frac{3}{8}$-in. plate and an unsupported length of 3$\frac{1}{2}$ ft., the rail broke with a 1-ton weight falling 1 ft. But with the standard 6x$\frac{1}{2}$-in. plate the joint stood two blows falling first 6 ft. and then 7 ft. The chief engineer is R. H. Chapman.

Water Problem Mostly Rural In Central Drought Area

From an Editor's Notebook

Small communities in states west of the Mississippi which depend on surface waters impounded in small reservoirs are chief drought sufferers other than individual farmers—City supplies generally have proved adequate

Topeka, Kan., July 24, 1934

WITH TEMPERATURES of 100 deg. and above for more than two weeks in Nebraska and Kansas, burning corn and other crops, and a rainfall deficit that is compelling thousands of farmers over a large portion of the eastern two-thirds of this area to haul water for stock, the immediate seriousness of the present drought is all too evident, even to the casual observer. The more thoughtful observer, who seeks its deeper significance, especially as it bears on engineering matters, will find that as yet very few municipalities are suffering because of deficient water supplies. The chief sufferers are the small towns dependent on surface waters impounded in reservoirs with small runoff areas. No large cities are threatened and no unusual health hazards are reported from depleted supplies. Sterilization of temporary supplies is proving to be sufficient for the emergency. Most of the towns affected have long been warned of the inadequacy of their supplies but are smaller than those ordinarily considered profitable for consulting engineers to nurse along to better and larger plant capacity.

While city people are getting water, the plight of those in the country who must depend on shallow wells and surface supplies has created state-wide problems of serious import. Much of the huge government cattle-buying program is accelerated by lack of water, although the primary factor is lack of feed and pasture. As a result, water-conservation programs have received an immense impetus, and relief agencies cooperating with the more permanent planning organizations are expected to produce some lasting results.

In Kansas such a program, outlined by the emergency relief committee, includes the sinking of wells, construction of garden and farm ponds, state, city and county recreation lakes, control of soil erosion and development of municipal supplies. Requests from counties for aid in the development of water facilities aggregate $10,000,000.

Never before have geologists been so much in demand, particularly those experts like George E. Condra, dean and director of the conservation and survey division of the University of Nebraska, Raymond C. Moore, University of Kansas, and Dr. Buchler, state geologist of Missouri at Rolla. The transition from the porous tablelands of the West to the close-textured prairie soils of the eastern parts of Nebraska and Kansas, coursed by the Platte, Arkansas and other easterly flowing streams of various characteristics, makes a water problem especially dependent on a knowledge of the geology of the region. This is particularly true because the underground supply is the key to the present situation. Engineers are cooperating closely with the geologists, each taking full advantage of the other's professional knowledge for the benefit of the stricken people generally.

Meteorologic conditions

For the first five months of this year the rainfall in Kansas and Nebraska was but 40 and 66 per cent of normal (*ENR*, June 28, p. 834). Typical of what has happened since then in the midst of the growing season are records up to July 1 at Lincoln, Neb. In April, May and June the rainfall was 0.35, 0.49 and 2.27 in., respectively, as against normals of 2.53, 4.08 and 4.32 in. This is the lowest rainfall in the 56 years of record. March 1 to July 1 had a total of 3.91 in. against a normal of 12.20 in., but up to June 1 there was only 1.64 in. against a normal of 7.88, or only 21 per cent of normal. The June rains were too meager to do much good and so have been the few in July. Essentially the same story holds for Kansas, though the eastern Kaw valley area had scattered showers advancing the corn somewhat ahead of the northern and western areas. All to no purpose, however, for the prolonged high temperatures for the first three weeks in June when the corn was in tassel dessicated the pollen before fertilization could take place.

Maximum temperatures recorded by the Weather Bureau for the hottest 16-day period on record in Topeka are as follows:

July 10	102	July 18	108
July 11	100	July 19	110
July 12	105	July 20	109
July 13	107	July 21	107
July 14	108	July 22	102
July 15	111	July 23	104
July 16	107	July 24	110
July 17	107	July 25	109

On July 26 the sequence was broken by a cool northwest breeze, and temperatures ranged in the nineties with a thunder shower in the early morning of the next day. Topeka had a heat wave in 1901, when temperatures remained above 100 deg. for nineteen consecutive days, the drop coming on July 26 as did this year's break.

Lincoln records are equally severe. For the three last days of May the 100 mark was exceeded, also for seven days in June. The July record is given in the following tabulation:

CORN FIELDS in the neighborhood of Lawrence, Kan., appear to be unaffected by the drought, but close inspection shows almost no ears formed.

July 1	98	July 14	102
July 2	100	July 15	112
July 3	102	July 16	108
July 4	107	July 17	106
July 5	88	July 18	106
July 6	75	July 19	111
July 7	85	July 20	110
July 8	101	July 21	107
July 9	102	July 22	105
July 10	98	July 23	104
July 12	105	July 24	105
July 13	102		

This holds generally for the corn areas concentrated in the eastern part of both states with generous plantings extending beyond the center of Nebraska and all across the northern tier of counties of Kansas. Much of this corn from personal observation late in July looked well advanced with sturdy stalks, but when examined closely was found with paper-dry tassels and extremely few ears fertilized. Ensilage is all it is good for, and today thousands of head of cattle are being fed the green corn. Officials of the relief and AAA organizations are making daily appeals to save every bit of roughage. Improvised silos made as trenches in the ground sealed over with earth are being used to supplement the 3,000 tank silos in Nebraska.

Lack of rainfall ruined the small grain crops and reduced the normal hay crops by 50 per cent or more. Oats were a complete failure. In the panhandle area of the Southwest and scattered eastern areas of Kansas where some winter wheat is grown there was gathered a fair crop, and relief in these areas is not so urgently called for.

Irrigated areas

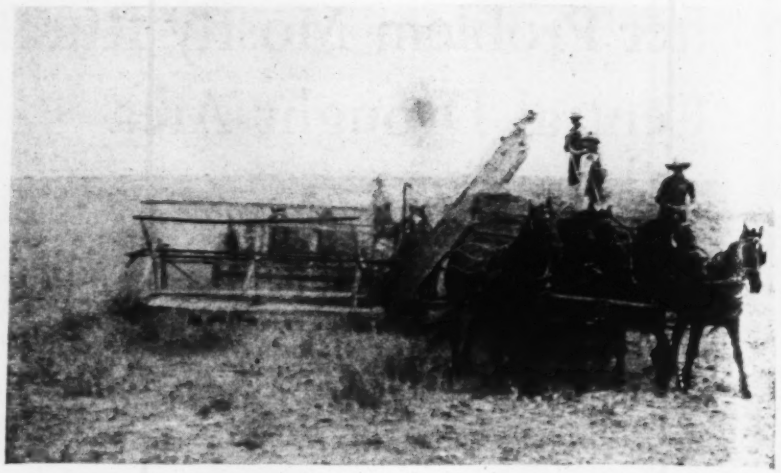
In both states irrigated areas have not been affected materially. Along the North Platte and the Arkansas Rivers, alfalfa and truck crops will be not far from normal. Sugar beets are yet to be "topped off" with August water. The North Platte areas depending on releases from the 1,200,000-acre-ft. Pathfinder Reservoir have been receiving 40 per cent of their normal demands. On July 24, 2,500 sec.-ft. was released, as compared with an ordinary 4,000 sec.-ft. in July continuing to the middle of August, when it drops rapidly to zero at the end of the month. There was 100,000 acre-ft. in the reservoir on July 24, about one-third of the amount stored this year, which filled to 330,000 acre-ft., or about one-third of the total capacity. Last year it filled less than one-half, 415,000 acre-ft., and in 1932 three-quarters, and in 1931 about one-half. In 1929 it ran over the spillway and nearly did so in 1930. There has been a deficit, therefore, for three years previous to 1934.

Pumping in the 20,000-acre Garden City area in the Arkansas River valley has lowered the water but a very few inches below normal, so that beyond a minor additional power cost the season will not be especially abnormal from the water standpoint. Some minor pumping projects in other sections of the two states may be included in this same observation, for, generally speaking, groundwater tables in the 19,000-square mile sand-hill area of north-central Nebraska, and in the Loup, Platte and Arkansas valleys have not been materially lowered beyond the normal fluctuations of 1½ to 2 ft. in the valleys and 2½ to 3 ft. in the sand hills. There is then no water problem in these areas, and to them many feeder cattle are being driven, the owners standing to make handsome profits out of cattle purchased at distress prices of $3 to $3½ per hundredweight.

Recorded groundwater levels in the western Kansas high-plains areas made by G. S. Knapp, chief engineer, division of water resources, for the last three years indicate a sine curve with a 1-ft. fluctuation, the present year being down but 0.2 ft. from last year. The serious water problem in Kansas and Nebraska is then in the rural areas where man and beast depend largely on wells and surface supplies.

In the far western portion of both states summer droughts are of annual regularity, and deep wells, little affected by surface flow, are usual or else the ranches would have been dried up long ago. The central and eastern portions are the ones that present the real problem. In shale, loess, drift, loose and coarse-textured soils the problem multiplies. Wells in the shale may tap thin sand lenses, whose annual replenishment is not always sufficient. In some few cases, as in a small area in northwest Nebraska, water entrapped in geologic times has become exhausted just at this time. With no chance for replenishment and no surface sources available within reasonable distance, the population may have to move out.

Along certain eastern rivers and drainage ditches in the loess and drift formations, deepening their beds through porous strata has drained many a shallow well in the vicinity. Deepening the well below the stream or ditch bed will suffice if the water-bearing strata persist. If the well bottom is in shale ledge, another location will have to be found. This drying up of wells due to leakage into drain courses is characteristic of southeastern Nebraska and Kansas as well as of similarly drained areas across the Missouri River in southeastern Iowa and northwestern Missouri.



SPRING WHEAT in the basin to be occupied by the projected Sutherland Reservoir in Nebraska is being harvested as hay, the wheat yield being less than 2 bu. per acre.

Geologists locate wells

Four new CCC camps have been established in Nebraska to work on well drilling. Some anxiety is felt on the part of geologists as to how successful they may be unless assistance is sought of those acquainted with water-bearing conditions below the surface.

In Kansas the emergency relief committee has commandeered geologists from all the colleges and universities and has sent them throughout 23 counties to prospect for water. These counties are in the eastern two-thirds of the state. Some 160 wells have been completed, and 500 more are contemplated.

These wells, paid for by relief money, are community wells, and the owner of the property on which the well is located must sign a contract permitting such community use. The well equipment, if the farmer cannot transfer a pump from his dry well, is rented from a dealer. When the emergency has passed, the rented pump and engine will be returned and the well sealed, awaiting a return of a similar emergency.

Relief problems

As noted, the Kansas emergency relief committee is vitally concerned with the drought and has promoted a water-conservation program as one measure of relief. John G. Stutz, executive director, through his engineering department headed by George M. March, has now under consideration six small

storage-reservoir projects ready to be put under construction with relief labor. An additional dozen are under consideration. Time of completion, March 1 next year, will preclude considering many more. Thus the drought has provided a line of "first consideration" work-relief projects, but it also will accentuate the load of last winter when 63,000 were on the rolls. Many more farm indigents will be on the roll this year than last.

The water-conservation program contemplates aid in locating underground supplies by the geologists, drilling, digging or driving community wells, renting pump equipment operated with relief labor, installing large pumping stations on streams or lakes to which farmers may come to fill tanks. There is, in addition, a program for garden ponds and farm ponds to be carried out by the farmer alone or in conjunction with his neighbors. Temporarily, at least, such labor may be placed on so-called homestead rehabilitation rolls. This is a form of relief whereby the farmer is paid on a budget basis for rehabilitation of his own premises. Plans are furnished by the engineers for water-conservation work. In addition, the State Forestry, Fish and Game Commission is building a number of lakes for recreation throughout the state on donated land. In one case, that of Sedan, the relief committee is taking over the construction of a reservoir abstracted from a PWA project when bids on the latter were found to exceed the money available to build the reservoir and at the same time to construct the remainder of the water system.

Water-supply systems

Engineers and health boards of both states report that the condition of the water supplies in a number of small towns is more or less critical. The information included a few places in adjoining states, particularly the northern portion of Missouri, where similar conditions to those in eastern Kansas prevail. In Missouri in the so-called Pennsylvania formations deep underground supplies are largely too highly mineralized for use, so that the smaller towns have impounded surface supplies. The following cases are typical of conditions in these states:

Plattsburg, Mo., population 2,000, gets water from a creek of 30-square mile watershed and filters it. At the end of July it had only a few days' supply in sight and was rationing the water by opening a valve at the base of the standpipe for two hours morning, noon and night but keeping the tank full for fire protection. An algæ-laden puddle of water above the low dams was all that was left of what until this year had always been a live stream. The dam is to be raised.

Nowata, Okla., has depended on the regular flow of the Verdigris River, which is nearly dry. An emergency dam is to be thrown across the river, and bonds already voted await final affirmatory red tape before starting construction.

Maryville, Mo., population 5,200, is on the One-Hundred-and-Two River, previously a live stream. At present the town must depend on runoff. The water is pumped to an artificial lake, repumped to filters and repumped to the distribution system. The town has three weeks' supply but is drilling wells which probably will only intercept seepage from the lake.

Perry, Okla., population 3,500, has an impounded supply, filtered, with a reservoir not on a live stream but filled by stormflow. The reservoir was dry early in the spring, then was filled by a freshet, but now is dry again. Arrangements have just been made for ten tank cars of water daily from Tulsa to be dumped into the clear well at the filters. This will give 30 gal. per capita and costs 4c. per 1,000 gal. plus freight, both equivalent to $385 per day.

Creston, Iowa, population 10,000, has received wide newspaper publicity because it is being supplied by tank car from Council Bluffs at $600 a day, expense paid for by FERA. The supply was an impounded surface storage furnished by a private company.

Marceline, Mo., population 3,600, voted July 31 on $70,000 bonds to construct 3½ miles of 10-in. pipe line to bring water from Muscle Fork Creek, drainage area 170 square miles, to avert future shortage. That stream is now dry. The present impounding reservoir is on a 3½-mile drainage area.

Monroe City, Mo., population 1,800, has an impounded reservoir on a 1½-mile drainage area. It has been dry for three months and the town is pumping water 9½ miles through 3½-in. pipe hired from a junk dealer. Cost, $1,000 per month for 95 gal. per minute.

Butler, Mo., population 2,700, has a dwindling supply from an impounding reservoir on a small stream. It is drilling for water, which it is known will be salt (as is the case in all the near-by towns) but needs the water for fire service.

Lawrence, Kan., population 14,000, will soon put in a jetty to turn water in the Kansas River to its intake during low stages. It is giving away 1½ m.g.d. to farmers who haul it away in tanks.

Pleasanton, Kan., population 1,200, is not dry this year, but during 1931 and 1932 for six weks it paid $2,424 for water hauled in tank cars 5 miles and pumped it ½ mile to its impounding reservoir in a deep gully. The dam there has since been raised.

Herington, Kan., population 4,600, has storm storage which became low in May. It continues to sell its treated sewage to the railroad, making up the additional demand from the reservoir. Late in July it had an estimated 90 days' supply left and was pumping from the old railroad lake supply (*ENR*, Nov. 2, 1933, p. 521).

ALFALFA in the dry-farming area in the Platte Valley is yielding less than 1 ton per acre on the first and second cutting. The crop, however, brings high prices when shipped to Wisconsin.

Comparatively few supplies in Nebraska are from surface sources. These include Omaha, Nebraska City, Ord, Tecumseh, Chadron, Crawford, Falls City and Weeping Water. The last two supplies failed, and water is shipped into Falls City and distributed by tank wagon. Private wells are drawn on heavily. These are the only municipal failures in Nebraska. The state board of health is not worried about city supplies.

Lincoln, Neb., population 76,000, is reaping the benefit of going 25 miles to the Platte River at Ashland for its supply two years ago (*ENR*, April 20, 1933, p. 48). The level of the old wells in town has risen 20 ft. or more. They are used for half the supply at peaks. For the last three weeks in July, 19 m.g.d. was used, more than twice the average. The rise in the well level has removed the danger of "salting," and the commercial load of the Burlington Railroad and one other industrial ac-

count has been taken on. No restrictions are enforced on consumers, rather they are exhorted to use water plentifully. Nevertheless, few green lawns are in evidence, and the few who do sprinkle freely complain of the cost.

Missouri conditions

Missouri municipal supplies in the northern half of the state are from impounding reservoirs and, with four exceptions, according to Herbert Bosch, state public health engineer, are badly depleted and in many cases entirely exhausted. In this part of the state the drought is much more severe than in 1930-31. Several small cities are pumping water through rented pipes for long distances from streams. The larger cities in the central and northern sections of the state are on the Missouri and Mississippi Rivers and thus are better situated. Deep wells in the northern half of the state are too highly mineralized for domestic use, but occasional shallow groundwater from glacial drift is available. Southern Missouri has satisfactory deep wells still furnishing sufficient water, although levels have been lowered. Twenty field geologists are assisting in locating emergency rural water supplies.

Rural Iowa wells hard hit

Effects of the drought on both rural and urban water supplies in Iowa have varied according to the geological outcrops and subsurface formations. The state is fortunate in having available very complete information of the occurrence of underground waters compiled over a long period of time by geologists. This information is now being drawn upon freely, and geologists are not being called on to any large extent in the present emergency.

A. H. Wieters, director, division of engineering, Iowa state department of health, indicates that the Creston situation, where water is hauled by tank car 100 miles, is not being duplicated so far as municipal supplies are concerned. However, a few cities (at the end of July) are in serious condition.

Mt. Ayr was almost out of water, and the surface supply at What Cheer was completely depleted, but fortunately a well was available which continued to furnish a supply under drastic rations. Corning, Fairfield and Chariton, all using impounded sources, had very limited supplies left. These towns are all in the southern part of the state. The situation in other municipalities using surface supplies is not as yet serious.

Generally speaking, said Mr. Wieters, the towns in the western third of the state are using shallow wells, and in a number of these places the supply is short but with no imminent danger of complete failure. In the eastern two-thirds of the state, city supplies for the most part are deep wells on which the drought has had no visible effect.

Rural supplies in Iowa present a much more serious situation, particularly in the southern and western thirds, where it is a common sight to see farmers hauling water from the neighboring town. Most farmers' wells in these areas are shallow.

Dakotas were prepared

Water shortages in the Dakotas in the past two years have given such emphatic warning that almost every town had already deepened its wells or put down new ones. Surface water supplies in these states are at the best irregular in quantity. Some of the new supplies have not tasted as well as could be desired, and some have been costly to develop, but they have provided water. As a group, therefore, according to E. F. Chandler, professor of civil engineering, University of North Dakota, and veteran water conservationist of the Northwest, the Dakota municipalities have not experienced any insuperable difficulties due to the present season's drought, which has gone far beyond any previous records.

Normally half the annual precipitation comes in the three spring months; this year the spring rainfall was only one-third of normal. As this deficit followed a series of dry years, the groundwater has been lowered until innumerable wells have gone dry, and the streams of local origin have carried but a small fraction of their ordinary spring flow. Another result is that some cities getting supplies from rivers have found that the less-than-ordinary dilution of pollution has put a heavy burden on water-treatment plants. This is an expensive annoyance rather than a serious difficulty. The high spring flow is five to ten times the normal fall and winter flow. In the fall of 1932 and 1933, recorded lows were far below anything heretofore experienced, so now if the streamflow is only one-tenth of the spring normal it is several times as great as it has been during the two previous falls. Regular service with the additions heretofore arranged for has enabled waterworks officials to carry on with comparative ease. Complaints are in consequence less now than during some of the previous dry periods.

The farm situation, on the other hand, is quite different, paralleling the experience in Kansas and Nebraska. A great many farmers are hauling water long distances in tank wagons.

Crop conditions

After a week in the states of Kansas and Nebraska, driving in the Platte Valley through North Platte, Columbus to Fremont, thence to Lincoln and then by train to Kansas City, by motor to Lawrence and Topeka, one gets certain sidelight views: In the Platte Valley, alfalfa growers should be happy. Last year the average price was $6; this year it is twice that, and $20 was talked of. However, the crop is short in many fields visited. A ton to the acre for the first cutting was good. Attempts are being made to leave the third crop to "set" for seed, but without irrigation or rain the yield will be small. Hay was about half crop, but a high price will compensate. Alfalfa was going west by truck to ranchers and east by train to Wisconsin. Truckers were reaping the benefit of a good demand.

Corn is the most deceptive crop. Fields tasseling in July will probably make nowhere nearly as good a showing as those coming on later if they have soil moisture to mature. All in all, silos will pay handsome profits this year, for ensilage will be all that corn will produce on thousands of acres. The many "sealed" cribs of corn held by the government will likely pay out well. A few shellings are being made.

Small grains, such as oats and barley, are largely a failure, as is spring wheat. In the rich upland basin which will be turned into the 140,000-acre-ft. Sutherland Reservoir for the Platte Valley Power and Irrigation District, spring wheat, 10 in. high, that will run less than 2 bu. per acre, was being cut for hay. Yet all over this area were fine-looking farm houses and barns spaced less than a mile apart that would do credit to an Illinois or Iowa dairy region, thus indicating great prosperity.

Objections to the forest belt

The President's proposed belt of trees across the Dakotas, Nebraska and Kansas is not without strong objection from experienced local agriculturists. Trees and alfalfa are the great water robbers. Transpiration and growth of corn, wheat and oats require about ½ ft. depth of water over an acre. Alfalfa, which will send its roots down 25 ft., as will cottonwood and other trees, requires nearly 2 ft. of water for a 2½-ton yield. Trees cannot find this amount of water to sustain them on much of the area in Kansas and Nebraska, assuming that they were to be started with irrigation. Farmers have cut down many fence-line "windbreak" trees because they have found that the trees robbed the soil of water and prevented any yield for 50 to 200 ft. away from the fence line. If water now concentrated in the underground storage is transpired into the air, who will benefit? One gets the impression that Washington might well add some western experts who know about these water robbers to the group of experts who advised planting a forest belt.

Possibly the bottomlands in the Platte valley and the sand-hill marshes now evaporate more water than they would if covered with trees, but the same does not appear to be true of the uplands.

The best rain retainers are not cultivated fields but rather the grasslands, natural or man-planted. The high-percentage retention of the latter is a most potent argument for returning much

western country to range, not closely grazed. Nevertheless, some experiences of a PWA man who tried to persuade hardy pioneers not to go in debt too heavily for a high school leads one to believe that the farmers are there to stay—and they were in the 18-in. rain belt too. Apparently these people know how to average the present bad year with the one or two good ones that they have in a five-year period. No such condition appears to be general in Kansas or Nebraska as exists in the Dakotas, at least over any large area. As with the cotton planters of the old unprotected areas in the Mississippi valley, one good crop at good prices will keep the Kansas and Nebraska farmers going for at least two succeeding years. The western spirit is such that the good crop year is hopefully believed to be the next season. Optimism is rife in the West despite the depression and drought. —W. W. DEB.

Correction for Curvature in Highway Earthwork

Simple method of calculation based on resolving cross-section into triangles and rotating cross-section

By Sidney Rochlin
Arizona Highway Department, Globe, Ariz.

IN MOST INSTANCES, in the computation of highway earthwork by the average end-area method, the error introduced by not considering curvature in the roadway is ignored. However, in mountain highway work where sharp curves are combined with steep transverse sections this error may become large, in which case a curvature correction is necessary. Perhaps the most common method of making this correction is to plot the cross-section, transform it by means of an averaging line into a two-level section, and to use a curvature-correction formula developed for this simple form. The method outlined below may be applied directly to any type of cross-section. The computations take little time if a calculating machine or a slide-rule is used.

If AB and CD (Fig. 1) are two cross-sections taken along the curve FG, the correction on the earthwork lying between them will be the volume generated by rotating both sections about vertical lines at G and F respectively until they are perpendicular to the chord GF. The volume generated on the outside of the curve will be a positive correction, while that generated on the inside will be negative.

Now any cross-section may be resolved into pairs of triangles, as shown in Fig. 2. In a typical pair let r equal the distance from its center of gravity to the roadway center line, and r_1 and r_2 the corresponding distance for each of the single triangles. Also let c be the cut, $a=x_3-x_2$, and $b=x_2-x_1$. These are all shown in Fig. 3. The moment of this area around a vertical line on the roadway center line may then be derived as follows:

$$A_1=\frac{ca}{2},\ r_1=x_2+\frac{a}{3},\ A_2=\frac{cb}{2},\ r_2=x_2-\frac{b}{3}$$

$$Ar=\frac{ca}{2}\left(x_2+\frac{a}{3}\right)+\frac{cb}{2}\left(x_2-\frac{b}{3}\right)$$

$$=\frac{c}{2}\left(ax_2+\frac{a^2}{3}+bx_2-\frac{b^2}{3}\right)$$

$$=\frac{c}{2}(a+b)\left(x_2+\frac{a-b}{3}\right)$$

$$=\frac{c}{2}(a+b)\left(x_2+\frac{x_3-x_2-x_2+x_1}{3}\right)$$

$$Ar=\frac{c}{6}(a+b)\ (x_3+x_2+x_1) \qquad (1)$$

If l is the distance traversed by the center of gravity of these two triangles (when the cross-section is rotated), $L/2$ the distance along center line for which each section counts, and R the curve radius, we know that

$$\frac{l}{r}=\frac{L}{2R} \text{ or that } r=\frac{2Rl}{L}$$

Equation (1) thus becomes

$$\frac{2Rl}{L}=\frac{c}{6}(a+b)\ (x_3+x_2+x_1)$$

or

$$M = \text{correction} = \frac{L}{12R}\Sigma c\,(a+b)\ (x_3+x_2+x_1)$$

The factor, when divided by 27, to obtain cubic yards, becomes $0.003086\ L/R$. The factor may be found for different values of L and R and placed in a table. In order to reduce the number of decimal places involved, it may be multiplied by 1,000. To cancel this, the quantity found from the section is divided by 1,000 by shifting the decimal point in the calculating machine.

For an example we may take the following two fill sections on a 30-deg. curve.

Sta.		126.8	1754.5	
656 + 00	00	—5.7	—14.5	—70.0
	8	00 (8)	16.0 (137.0)	121.0
		72.2	1257.3	
	00	—3.8	—9.9	—74.0
656 + 35	3	00 (13)	16.0 (143.9)	127.0

Sums of products of top and bottom figures divided by 1,000 are 241.5 and 180.7 for each section respectively.

Factor from table = .5655.

Correction = (.5655) (241.5+180.7) = 238.8 cu.yd.

The quantity $c\ (a+b)$ is written above each cut, while the quantity $x_3+x_2+x_1$ is written below.

One advantage of this method is that these top figures may be used to check the total end area of the section. The entire correction is conveniently made in the original cross-section book.

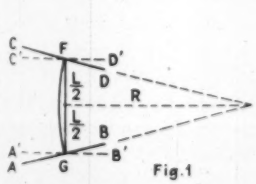


Fig. 1

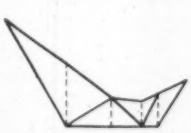


Fig. 2

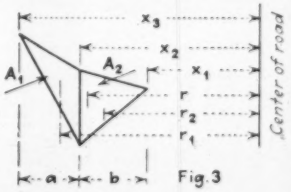


Fig. 3

DIAGRAMS illustrating process of calculating correction for curvature in highway earthwork.

A.S.A. Shows Continuous Growth

The American Standards Association has reached an all-time peak in membership, according to P. G. Agnew, secretary. At present there are 42 member-bodies and associate members and 1,233 company members. Formed in 1918 by five technical societies which felt the need of developing inter-industry standards out of their own technical standards, the American Standards Association is the national clearing house for standards and safety codes. Some 250 codes have been developed by the association, and nearly 200 are under development or are being revised. More than 3,000 representatives of manufacturers, technical societies, consumers and government departments serve on its committees.

ENGINEERING NEWS-RECORD

Volume 113, No. 6

Copyright 1934 by McGraw-Hill Publishing Company, Inc.

EDITOR—F. E. Schmitt. EDITORIAL STAFF—V. T. Boughton, W. G. Bowman, F. W. Herring, C. S. Hill, H. W. Richardson, J. I. Ballard, W. W. De Berard, N. A. Bowers.

Editorial and Publishing Offices at 330 West 42d Street, New York

August 9, 1934

Water Supply Found Wanting

THAT MANY WATER SUPPLIES have been found wanting under the test of the season's abnormal drought strongly supports the arguments of those who have been urging the necessity of bringing community water service up to the level of current needs. Although it is gratifying that municipal water supplies in the main are meeting requirements, yet the aggregate of present shortages in the smaller cities is startling, in view of the general belief that of all our public services the water service is most nearly adequate. Further, it is necessary to consider the chance of even greater rainfall deficiencies, which might bring water famine to communities whose supplies remain ample this year. The possibility that the drought will follow the precedent of 1930 and continue into next year must be kept in mind. Security against water shortage can be obtained only through the most generous provision for extreme possibilities, and though the goal of complete security recedes with advancing experience, no city can safely do less than make security of its water supply the primary objective of its planning.

Needed Stimulus

CURRENT EMERGENCY EFFORTS to locate and develop groundwater supplies in the drought area emphasize the inherent value of this resource. Dwindling surface supplies are a natural incentive in directing attention to the subsurface reservoirs, whose capacities and replenishment characteristics need intensive study if they are to be intelligently utilized. Where the underground supply because of fortunate geologic conditions has artesian properties, these resources need even more careful control and conservation, as outlined in an article on another page. The author, O. E. Meinzer, in charge of groundwater for the U. S. Geological Survey, is at present making a first-hand survey of general groundwater conditions in the Great Plains drought area where the Geological Survey and federal relief agencies are aiding local authorities in a search for these vital reserves. For years there has been delay and lack of interest in the fundamental study of groundwater, and engineers who realized the fragmentary nature of the available information were unable to get proper support from higher authorities. Present conditions, therefore, should provide the stimulus for instituting comprehensive research on the underground water resources of the country.

Resuming Investment

OPPORTUNITIES for sound investment of private money in the public-works field are increasing now that fears concerning the safety of municipal securities are largely dispelled. The pressure of deferred improvements is being widely felt, as in the case of the water shortages revealed by the drought, and the average citizen, who not many months ago was a thick-and-thin advocate of retrenchment, is once more coming to recognize that his own interest requires continuing regular maintenance and improvement work in his community. Moreover, the PWA campaign caused many cities to become conscious of their need for various improvements to which they had not previously given serious thought. In some degree these new investment opportunities have already been utilized, for many cities found the PWA procedure to be so slow that they turned to the public security markets in order to get their improvements built without delay, while others found that their credit as measured by obtainable interest rates was better than the PWA was willing to admit. Now that investment money is becoming available for sound and well planned undertakings, it appears likely that the private dollar will contribute more largely to the future progress of recovery.

Key Questions Unanswered

THE IDEALISTIC STATEMENTS of President Roosevelt at Bonneville and Grand Coulee last week, giving expression to the undeniable fact that the power resources of the Columbia River will have a large influence on the future of the Northwest, leave the key questions of these developments unanswered. There are large problems of policy relating to the application of the power, as indicated in this column last week; but besides these problems there is the broad question of how early it will be possible to find useful service for the power. These matters bear not only on the economic aspects of the Northwest developments but also are directly pertinent to the President's desire to set up a yardstick of power cost; for it is obvious that until the power is put to use, and until and unless it is placed under a sound and permanent policy of management, it is more likely to prove a mischievous sorcerer's wand that a constructive yardstick. Since nothing that the President said gives a compelling reason from the power standpoint why these works of future use are being built at the present time, their justification would appear to rest on their function in relieving unemployment. Unfortunately, the slow rate at which they are providing employment and the fact that they stood in the way of other public works through which quicker employment might have been obtained reduce their value in this respect; their effectiveness for social and industrial reform cannot be judged until something is known of their market and policies.

The Rising Tide

AN ABOUT-FACE on the part of the American Institute of Consulting Engineers in regard to the engineers' code is a clear indication of the rising tide of opposition to attempts to place engineers and architects under an NRA code. The institute was one of the sponsors of the code now before the NRA and took part in the redrafting that has been going on almost continuously since the code was first submitted, in an effort to adjust it to meet the changing requirements of the NRA. Like many others, the institute went into the code work with many misgivings but with a feeling that the work of architects and engineers is closely tied to that of the other elements of the construction industry and therefore should be brought in under the construction code despite the exemption of professional men from provisions of the NIRA. But as successive rulings and limitations have reduced the possible advantage of such a code without eliminating any

of the disadvantages, many of the original proponents have developed misgivings as to its desirability. The institute now goes a step farther; it definitely rejects the code and asks to have the code for the construction industry so modified as to eliminate from code control the professional men within the industry—the architects and engineers. Because it is the one organization among the original sponsors whose entire membership would come under the code if approved, its voice, though small, must carry considerable weight in the final determination of whether or not the engineers within the construction industry shall press for approval of a code.

New Possibilities

VALUABLE SUGGESTIONS for extending the application of that interesting material, plywood, reside in the data supplied by the Forest Products Laboratory tests, published this week. By overcoming many of the limitations arising from the grain weakness of ordinary lumber the material creates its own special field of application. Building and construction already have discovered many of its possibilities, though doubtless more remain to be explored. The experiments now recorded bring out structural qualities which, with further development work, as on nailing and connections, give promise of extending the range of economy of wood construction. The new characteristics realized through the partial neutralization of grain effect are illustrated in the composite girder structures tested, and their value is shown by the high results obtained in respect to strength and rigidity. There is a field for both research and practical study in discovering the fullest and best ways of putting these characteristics to use.

Working To a Plan

THE FIVE-YEAR CONSTRUCTION PLAN of Soviet Russia captured the attention of the industrial world when it was proclaimed in 1928. It has long been known that the grandiose anticipations of its projectors were not realized, as set forth in a group of articles begun in this issue. But the measure of success attained seems more important than the partial failure—success being expressed in the fact that at a time when the chief industrial nations almost ceased construction, the Soviet States, through energetic prosecution of construction, made a large step ahead in industrializing a people quite unprepared for the change. The significance of this accomplishment is that it resulted from a calculated plan based on an appraisal of the industrial needs of a whole nation. Its nearest counterpart is our own industrial recovery administration, which developed without plan and whose heterogeneous adventures in construction owe their measure of success to the fact that they were launched on a nation prepared by existing organizations and facilities to take over their management. Measured by results, the Soviet undertaking suffers little in comparison.

For Constructive Relief Next Winter

THE PREVAILING LEVEL of employment and business activity makes it certain that the coming winter will see a need for unemployment relief activity quite comparable to that of a year ago. Gains made in industrial reemployment are largely offset by the number of those still without a job whose savings have been depleted. It appears a foregone conclusion, then, that a program of the type of last year's CWA will be undertaken during the coming fall. If the maximum degree of success from such a program is to be attained, it is essential that plans and preparations for it be begun at once, and that they be placed on a thoroughly sound basis.

A review of the operations of the CWA program of last winter, and the somewhat attenuated form of it that has been continued ever since, brings to light several important abuses that have contributed to loss of effectiveness. If similar losses are not to be repeated, it becomes necessary to confront past mistakes honestly and to shape the new course courageously so as to avoid them.

An important obstacle to productivity in work-relief programs so far has been a too drastic restriction on the use of materials and equipment. Work projects have had to be sought out that would absorb the greatest number of men and the least amount of anything else. Many times this has not been easy, and the most meritorious projects from the community point of view have frequently had to be passed over in favor of some far less important improvement that happened to be better suited to picks, shovels and strong backs. This restriction, of course, had for its purpose the concentration of expenditure on job labor. But it seems to neglect the fact that materials and equipment used on the job are not produced without labor and that it is in their production that unemployment has been at its most sickeningly low point. When unemployment-relief costs were borne largely by the local community, it was easier to understand the desire to restrict the benefits to local labor, but when the costs are almost wholly on a national basis considerations of local preference should logically disappear.

The steady encroachment of work-relief operations into the field of normal necessary public-works construction has been a tragic abuse of the work-relief principle. When the CWA was first put into service, the rule was that regular construction operations were not a proper field for its expenditures. But under the pressure of local desire for federal subsidy, this sound principle was gradually left behind. In consequence, reemployment through the medium of the work-relief agencies resolved itself largely into reemployment of those thrown out of work through the disbanding of established construction organizations. The gain in employment was naturally far less than it should have been.

In a similar fashion during the past year municipalities have succumbed to the seduction of federal subsidy by depending upon relief labor for normal maintenance and replacement operations. Laying off city employees so that taxes may be reduced and then reemploying them as relief workers engaged in their regular occupations makes a mockery of reemployment programs. It is taxpayer relief, but hardly unemployment relief.

In brief, let there be no mistake about the fact that a large program of unemployment relief will be forthcoming next winter. The shortcomings of the past programs are plainly evident. If they are not to be repeated they must be carefully studied and policies determined that will avoid them.

CURRENT NEWS

Start of Drive for Home Modernization Set for Aug. 15

THE new Federal Housing Administration is rushing its plan to inaugurate the home modernization drive on Aug. 15. By that date rules and regulations and educational material to carry forward the program will be placed in the hands of 18,000 lending institutions and state directors of the National Emergency Council for distribution among chambers of commerce, service clubs and other community organizations as the start of intensive local campaigns.

Financial institutions affiliated with the Federal Reserve, RFC, or Federal Deposit Insurance Corp. automatically become eligible for government guarantee of loans and may begin making loans immediately upon the receipt of the new rules and regulations. Although the Federal Housing Administration intends to discount such loans, there is no intention of permitting private lending institutions to pyramid their operations with the aid of government money. Institutions which are evidently beginning this type of operation are likely to find that FHA will restrict guarantees on future loans. FHA has taken the position that many financial agencies are willing and ready to loan their own funds, as protected by the government's guarantee up to 20 per cent of the total.

Delays in instituting and carrying out the program will prove serious because of the shortening of the present building season. To offset this factor the FHA is making efforts to sell the idea of winter construction, particularly modernization and repairs, which do not need to be interrupted by winter.

The home building and mortgage insurance features of the present administration's housing program will not be effectively developed and ready for operation for several months. This results from the more elaborate procedure necessary to carry out the borrow-and-build program. As a result, the administration is stressing the modernization drive.

The failure of the expected price inducement to materialize has been a disappointment. The only concessions on building materials and wage rates will be those negotiated locally in community campaigns.

Water Shortage Restricts Lawn Sprinkling at Springfield, Ohio

Dwindling water supplies at Springfield, Ohio, reached a point on July 21 where city officials restricted lawn sprinkling to two hours per day, with police ordered to stop violation of the emergency rule. Local consumption had reached a figure of about twice the normal amount as temperatures continued above 100 degrees. Three test wells recently sunk were not producing suitable water, according to reports.

Another Ten-Day Stay Granted For Structural Steel Code

On August 6 a further stay of ten days was granted by the NRA on the effective date of the code for the Structural Iron and Steel Fabricating Industry. The effective date becomes August 16. Conferences are in progress between NRA officials and representatives of the code committee of the American Institute of Steel Construction which protested the Administrator's order separating the erection of structural steel from the code as presented by the industry and placing such erection under the provisions of the construction code. The rejection of the code by the Institute was reported in *ENR* July 26, p. 122.

Suit on PWA Loan to Municipal Power Plants in Supreme Court

The first of a series of suits instituted by power companies to stop the loaning of money by the PWA to cities for the construction of municipal power plants reached the United States Supreme Court Aug. 4. This first suit was brought by the Consumers Power Co. of Portland, Maine, against the city of Allegan, Mich., to forestall use of a PWA loan made Dec. 1, 1933, for $410,000, by the Michigan city to construct a dam, power plant and distribution system. Of this amount the government, in accordance with the usual PWA program, would contribute 30 per cent as a direct grant and proposed to loan the remainder at 4 per cent, secured by general obligation bonds to be issued by the city.

The power company, as a taxpayer, brought suit in the local federal court last January to stop the issuance of the general obligation bonds. The suit was based on the position that the city had reached the limit of its bonding power. The Circuit Court of Appeals set aside the injunction issued by the district court, holding that the validating act passed by the Michigan legislature last year permitted the issuance of additional bonds which had been approved by a majority of the voters of the city.

Information which has reached the office of the clerk of the Supreme Court indicates that a number of similar suits are to be filed.

PWA Staff Salaries Adjusted In New Classification

An adjustment of all PWA staff salaries was made by the Government in the pay checks of July 15. Individually, the adjustment, effective from July 1, represents both increases and reductions, but there is very little change in the total payroll. The adjustment is the result of a reclassification of all employees, ordered by President Roosevelt several months ago, to bring the salaries of PWA's non-civil service employees into line with salaries paid in the civil classifications of the regular government establishment.

This reclassification has resulted both in increases and reductions in grading and puts all PWA employees on a net basis, after deducting the 5 per cent still applicable to Government pay checks. In common with other Government employees, the PWA staff now receives 95 per cent of the salary rated by their classification. Restoration of the remaining 5 per cent will depend upon the trend shown by the cost of living index on Jan. 1.

Southeast Streams are Normal and Reservoirs Full, But Groundwater is Low

PRESENT surface water conditions in the Southeast are in marked contrast with prevailing drought in the central section of the country. The storage reservoirs of the large hydroelectric systems in the Southeastern states are full and little steam reserve capacity is being used.

Last February, the conditions in these states were reversed, the pond levels of most storage reservoirs were at lowest stages of record, when they should have been full or fast filling, some reserve steam plants were running to capacity and groundwater levels were falling when they should have been rising. However, beginning with a widespread storm in February, precipitation has since been frequent and well distributed. Groundwater levels have continued to rise during the first half of July, when they normally start dropping about May 15. Stream flow also has held up well during the spring and summer when it ordinarily drops rapidly. With even less than normal precipitation from now until the fall and winter rains, southeastern power companies will have ample hydroelectric power, with little or no call on steam reserves. Practically all crops are matured and only too much rainfall can harm them now.

In spite of favorable surface water conditions over the area east of the Mississippi River and south of the Ohio and Potomac Rivers, groundwater reserves in these states are generally below normal. Several years of deficient or badly distributed rainfall have resulted in seriously depleting subsurface supplies. While frequent and copious rains in recent months have helped, officials believe that excess precipitation over a long period will be needed to bring water tables back to normal. Since most of the low-water flow of many important Southeastern rivers is from springs, less than ordinary minimums may be expected annually until groundwater reserves are replenished. For the next few months, at least, Southeastern municipalities and power companies will have no concern about water supplies.

Intense Local Rain Breaks Dams and Floods City in South New Jersey Tidewater Area

FOLLOWING a rainfall of 7.22 in. in 12½ hours, concentrated in a small area in southwestern New Jersey, a local flood on Aug. 3 swept out several small earth dams on the Cohansey River and converged on the city of Bridgeton, wrecking the municipal water supply and destroying the three bridges connecting the residential and business sections of the town. Bridgeton, an industrial city of 16,000 population located at the head of tidewater on the Cohansey River, 40 miles southeast of Camden, was without water supply for 22 hours. For 2½ days there was no means of crossing the river between the two sections of the city until a pontoon bridge was built by the First Engineers from Fort du Pont.

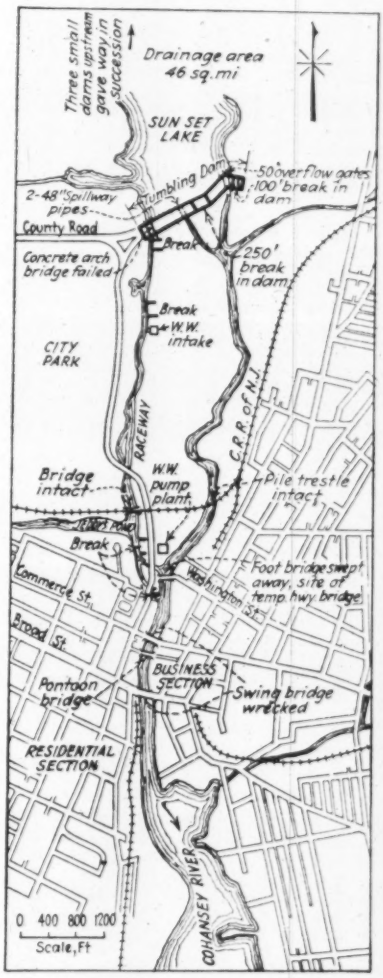
The flood was most unusual because of its concentrated intensity in an almost flat tidewater area. Damage was confined to an area 15 miles square, with Bridgeton at the southeast corner of the flooded district. An official U. S. Weather Bureau observer reports 7.22 in. of rain falling at Bridgeton between 4 p.m. Aug. 2 to 4:30 a.m. Aug. 3. There was no severe storm accompanying the rainfall. Crops within the flooded district are unharmed, though railroads, bridges, highways and dams were swept away.

Through most of the city the original meandering river had been confined to a 70-ft. straight channel by timber bulkheads, with the adjacent ground filled in. Above the city for a mile the river wanders through backwater marshes. The river has a tidal range of 7 ft. at the city, which is about 10 miles from Delaware Bay. Despite the large tidal range, the river at the city is fresh.

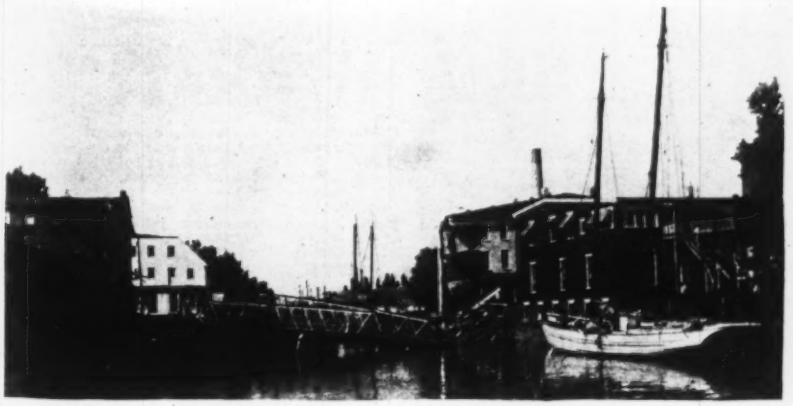
Old earth dams fail

Upstream from the city were five lakes, (the first a mile from town) all created by old earth dams with little or no spillway provisions. Three of the dams were on the river proper, two on tributaries. These dams, estimated from 85 to 100 years old, were originally built to provide power for local grist mills. From Sunset Lake, nearest the city and created by Tumbling Dam, a raceway or canal runs parallel with the river on the west side to the center of town. Originally this canal served a grist mill and iron foundry. Though these industries passed out of existence long ago,

(Continued on p. 192)



ROUTE of river through Bridgeton, N. J., showing locations of flood damage.



WRECKAGE of Commerce St. Bridge. Collapse of building in background is typical of damage caused by undermining of timber bulkheads.

Correlation of New Jersey Code With NRA to Be Discussed

A conference between NRA officials and Governor Moore, of New Jersey, is scheduled when Administrator Johnson returns to Washington, to discuss the correlation of NRA codes and codes under the New Jersey State Industrial Recovery Act. The conference was suggested by Governor Moore in a letter made public July 26, answering General Johnson's definite proposal on July 11, that steps should be taken by the state administration to harmonize inconsistencies between the NRA and the New Jersey state codes which have been set up.

The letter of Administrator Johnson, July 11, to Governor Moore, stated that "State codes should be identical in their provision with federal codes," and that "such integration should apply not only to code authority organization, but to budgets and assessments as well."

In reply, the Governor indicated that the State Recovery Act and the subsequent organizational activity had the same identical objective as the NRA. "We want to cooperate with you in every possible way; indeed, the New Jersey Industrial Recovery Act provides that state codes for industries which have federal codes must not be inconsistent with such federal codes, 'due regard, however, being had for local conditions and local customs.'" The Governor closed with a request for a personal conference to discuss the entire situation.

Pumping Continues at Flooded Shaft on Colorado Aqueduct

Unwatering is still in progress at the Potrero shaft on the east end of the San Jacinto tunnel on the Colorado River Aqueduct, following its flooding on July 1 when the headings had been driven 50 to 60 ft. from the shaft. Water broke through into the east heading about 3:30 a.m. on the morning of July 1 while men were at work in the west heading. The flow, which formed a wave 2 ft. high, according to reports, crossed the sump at the shaft and within a few hours was 11 ft. deep in the tunnel. Eventually it rose to a depth of 646 ft. in the 796 ft. shaft.

Two deep-well pumps, each with a capacity of 1,200 g.p.m., were put in operation and these lowered the water level about 280 ft. Later a third pump with a capacity of 2,600 g.p.m. was installed. Drying sheds have been erected and preparations made for reconditioning the electrical and mechanical equipment which has been submerged during the month.

House Moving Placed Under Construction Code by NRA

The moving of buildings from one location to an adjacent site, if carried out by the use of rollers, jacks and similar equipment, and the shoring of buildings, and the erection of stacks, have been placed under the jurisdiction of the Construction Code by a recent ruling of the NRA.

On the other hand, the moving of buildings, when carried on by vehicles using the highway, subjects the moving company to provisions of the trucking code, "inasmuch as such work constitutes a 'for hire' trucking operation."

Proposed Codes Affect Sewage Treatment and Water Supply

Public hearings have been held on proposed codes for the Sewage Equipment Industry, as a subdivision of the Machinery and Allied Products Industry, and the Water Supply Industry. A public hearing was also held, July 30, on a proposed code for the Water Well Drilling Industry, as separate from the construction code. In this last case, the construction code authority asked permission to file a brief in opposition to a separate code for this industry.

The proposed code for sewage treatment equipment would include design, manufacture and installation, when required, of all machinery and equipment necessary for handling municipal sewage or trade wastes from industrial plants in the process of purification. Air compressors, blowers, pumps, pipe and pipe fittings, air diffusion plates, and any machinery or equipment having to do only with sludge disposal are not included.

Installation of these manufactured products incorporated in and to fixed structures, or other fixed improvements, intended for use in sanitation is already clearly defined in the definition of the construction industry. The construction code authority and the divisional code authority for general contractors has requested the deletion of "installation" from the definition of the proposed code to avoid conflict, the manufacturer being permitted, under the construction code, to install his own products provided he conforms with the provisions of the construction code.

On August 6 a public hearing was held on a proposed code for the Water Supply Industry, sponsored by the Institute of Water Supply Utilities, Inc., which claims to represent 65 per cent of the private water supply industry, furnishing about 15 per cent of all water supplies.

The industry, as defined, supplies water service to the public through water distribution systems, storage, purification and pumping facilities. There is also included in the definition the construction, replacement and repair of facilities which, by and large, are already included under the definition of the construction industry and are performed under Chapter II. Design of these facilites is also covered in the Professional Engineers code now pending. For these reasons both the construction code authority and the divisional code authority for general contractors have protested the definition in its present form.

It was evident at the hearing that municipalities and other public bodies were adverse to participating in this code, even on a voluntary basis, and recommended the deletion of the provisions of the code providing for such voluntary participation.

Members of the general contractors division of the construction industry and certain classes of their employees in Jefferson County, Kentucky: Fort Knox, Kentucky; and in Floyd and Clark Counties, Indiana, have submitted to the N[illegible] for approval a collective bargaining a[illegible]ment embracing the territory named dealing with hours and wages of l[illegible] and conditions of employment.

PWA Funds Have Been Reduced By $100,000,000 in Budget Set-up

Funds considered earmarked for Public Works Administration have been shifted to other budget items in the set-up for the coming fiscal year. The amount thus deducted from the PWA fund is reported to be $100,000,000, based on the original plan to set aside $500,000,000 for the PWA from the appropriation of the last Congress. The only explanation which has been offered by PWA is use of $65,000,000 for federal public buildings which are not under PWA supervision and $40,000,000 for naval construction.

A possible reason is the desire of President Roosevelt to maintain a temporary reserve of $100,000,000 out of the public works original fund until conditions affecting other plans, have been studied.

Out of the total appropriation of $4,700,000,000 originally scheduled for PWA funds an unallocated balance of $[illegible]554,896 remains as of July 21, exclusive of various reserves. This balance may be supplemented later by the purchase of municipal bonds from the PWA by the RFC up to an authorized maximum of $250,000,000 at any one time.

Approved Allotments of Public Works Funds to Non-Federal Projects by States Through July 11

	Total Proj.	Total Allotments	No. Pro.	Streets & Highways	No. Pro.	Utilities	No. Pro.	Buildings	No. Pro.	Irrig., Flood Control and Navigation	No. Pro.	Structures	Aviation and Miscellaneous	Railroads
Ala.	40	$5,600,302	3	$1,461,000	28	$1,928,500	8	$778,800		$	0	$	$	$1,432,002
Ariz.	13	2,821,000	1	147,000	8	1,315,000	1	14,000	1	100,000	0		915,000	330,000
Ark.	56	9,024,008	0		31	3,176,000	22	5,208,008	1	552,000	1	20,000	68,000	
Calif.	167	50,218,433	11	1,908,900	43	20,938,300	93	15,203,270	40	5,660,824	8	2,200,100	360,000	3,947,039
Colo.	38	8,596,305	1	1,800	28	5,445,700	5	437,800	3	1,047,100	0			1,663,905
Conn.	97	7,819,834	60	4,164,000	12	1,628,600	13	775,400			10	996,600	63,000	192,234
Del.	12	3,196,513	0		3	257,000	8	645,200			0			2,294,313
Fla.	12	5,499,487	0		4	765,000	2	455,000	1	168,000	5	4,111,487		
Ga.	50	8,028,150	0		11	290,000	33	6,316,150	1	1,250,000	2	51,400	120,600	
Idaho	20	1,039,902	0		18	965,464	1	41,500			0			32,938
Ill.	190	82,536,872	13	569,700	119	56,650,240	44	6,510,561	3	2,673,000	7	7,516,750	120,300	8,496,321
Ind.	73	26,816,675	13	793,300	47	8,062,000	7	515,200			5	264,000		17,182,175
Iowa	160	7,118,640	49	624,450	68	3,524,590	33	1,347,100	1	3,200	6	1,594,200	3,900	21,200
Kans.	133	4,065,063	32	411,923	50	1,746,690	37	1,733,350			9	118,500	54,600	
Ky.	52	5,509,070	3	201,500	35	2,638,380	13	737,090			0			1,932,100
La.	33	13,263,700	3	659,300	10	3,770,500	16	493,900			2	7,470,000	85,000	785,000
Maine	10	530,005	1	14,300	3	64,350	5	152,900			0			298,455
Md.	36	27,323,154	4	5,547,866	20	2,174,100	11	1,192,000			0			18,409,188
Mass.	231	23,932,008	47	2,873,000	50	3,038,700	125	10,737,600	2	14,800	6	819,300		6,448,608
Mich.	35	8,590,982	5	340,000	23	3,595,200	4	898,814	1	410,000	0		303,000	3,043,968
Minn.	107	27,542,911	18	3,368,964	59	20,676,900	25	1,324,800			3	60,700	5,000	2,106,547
Miss.	30	5,070,736	3	599,500	7	458,000	16	406,016			1	1,150,000	14,800	2,442,420
Mo.	168	25,030,786	10	2,416,200	66	5,277,200	79	12,957,422			8	2,064,700	304,500	2,010,764
Mont.	30	5,912,994	1	1,648,758	15	333,900	12	2,933,000	1	75,000	0			722,336
Neb.	68	17,748,906	7	109,000	39	898,306	16	198,000	3	14,860,000	3	1,683,600		
Nev.	7	1,131,300	0		5	405,000	1	36,300			0			690,000
N. Hamp.	44	4,345,871	5	146,500	16	957,600	16	1,542,200	1	71,000	3	262,000	31,000	1,335,571
N. J.	85	52,591,950	6	332,600	23	9,009,700	48	9,041,900			5	24,910,000	27,100	9,270,650
N. Mex.	20	848,000	0		11	379,500	5	74,500	3	273,000	0			121,000
N. Y.	213	169,931,289	27	6,153,133	78	17,975,800	97	47,558,538			10	89,678,170		8,565,648
No. Car.	86	8,507,500	2	170,000	41	3,930,400	41	3,894,600			2	512,500		
No. Dak.	43	2,393,043	7	237,700	11	569,000	23	1,017,350			1	4,000		564,993
Ohio	166	38,609,323	27	598,600	102	27,242,900	28	3,697,400	1	500,000	5	188,400	338,400	6,043,623
Okla.	96	6,297,798	3	197,900	42	3,177,600	47	2,787,898	1	12,000	2	47,400		75,000
Ore.	9	9,665,620	0		4	2,558,435	3	386,150			1	5,602,000		1,119,035
Penn.	87	126,433,792	10	24,992,881	30	2,576,800	43	11,412,170			2	6,250,000	41,000	81,160,941
R. I.	54	7,242,528	4	255,000	9	924,500	37	5,790,228			2	134,000	138,800	
So. Car.	41	4,975,900	3	208,000	26	3,067,500	11	940,400			1	760,000		
So. Dak.	63	5,064,772	6	259,800	30	2,419,122	22	2,245,545			0		100,100	40,205
Tenn.	46	12,555,361	6	424,000	20	5,208,000	18	4,986,333			1	193,000		1,744,028
Tex.	249	49,738,957	10	1,797,732	118	11,457,600	87	11,529,825	18	21,694,500	5	788,300	36,000	2,435,000
Utah	40	3,620,600	0		32	1,745,900	6	1,826,700	1	11,000	0			37,000
Vt.	60	1,244,844	12	115,400	19	668,680	13	346,800			13	55,700	3,900	54,364
Va.	66	9,602,095	2	400,000	21	4,319,000	41	4,596,320			1	30,000		256,775
Wash.	86	3,125,832	43	261,650	9	1,419,250	23	729,900			7	67,300	49,000	598,732
W. Va.	36	16,614,789	1	5,114,500	28	3,405,200	4	734,000			2	980,000		6,381,089
Wisc.	90	15,293,354	7	540,950	52	11,096,515	27	1,278,200			3	36,300		2,341,389
Wyo.	5	574,200	0		3	184,200	2	390,000			0			
D. of C.	2	10,981,244	0		1	8,000,000	0				0			2,981,244
Alaska	7	400,400	2	116,000	4	196,500	1	87,900			0			
Hawaii	16	1,175,800	0		7	893,157	7	219,879	1	56,670	1	6,094		
P. Rico	3	451,000	0		0		3	451,000			0			
Totals	3,581	$946,253,598	477	$70,182,807	1,539	$273,606,479	1,283	$189,614,917	54	$49,432,094	143	$160,626,501	$3,183,000	$199,607,800
Percent of Total		100.00		7.42		28.91		20.04		5.22		16.98	0.34	21.09

Bronx Coal-Pocket Collapse Case Against Orzel Dropped

According to word from the office of the district attorney of Bronx County, the charges have been dropped against Paul Orzel, New York engineer, in connection with the collapse of a coal pocket in the Bronx on Feb. 21, 1930, in which three men were killed. In November, 1931, Orzel had been convicted in the County Court of Bronx County, N. Y., of second degree manslaughter for his part in designing steel framing supporting the coal pocket, and later the verdict was affirmed by the State Supreme Court, Appellate Division; but on appeal to the highest court of the state, the Court of Appeals (Jan. 9, 1934), the decision of the lower court was reversed and a new trial was ordered. Now, the decision of the Bronx district attorney against a retrial ends the case, and Mr. Orzel is freed of all charges in connection with the collapse. The Court of Appeals decision follows:

Defendant was indicted, tried, and convicted of manslaughter in the second degree, in violation of subdivision 3 of section 1052 of the Penal Law (Consol. Laws, c. 40). The indictment charged that by an act of culpable negligence he caused the death of Walter Adams. The specific act charged was that, in designing and drawing the plans for a steel substructure of a coal pocket, he drew such plans, details, and designs in a culpably negligent manner, and that by reason thereof the structure erected pursuant to such plans collapsed because of defects in the plans and caused the death of Walter Adams.

The issue presented was closely contested. Some of the members of this court are of the opinion that the people's evidence failed to establish that the defendant had been guilty of culpable negligence, and that the trial court should have dismissed the indictment.

We are all in agreement that the case against the defendant was so doubtful that any material error at the trial which resulted in material prejudice to the defendant should entitle him to a reversal and a new trial. There is no doubt that such error occurred. In fact, if the jury had understood and followed literally the last words of the court's charge, it would have necessarily found the defendant not guilty. The last request to charge made by defendant's counsel was: "I ask the Court to charge that if from the evidence the jury finds that the construction and erection of the building and the construction and erection of the steel under structure which it is alleged the defendant designed, if the evidence shows that the construction and erection was not in accordance with that plan or design, then they should bring in a verdict of acquittal." The Court: "I so charge."

Concededly, the structure was not erected in accordance with the plans and designs prepared by the defendant. In this court, it is admitted by the district attorney that the contractor, in erecting the structure, intentionally failed to place therein certain braces, tie rods, and bolts, and in other respects failed to follow the plans prepared by defendant.

Frank J. McNulty was the president of the corporation which owned and was constructing the coal pocket. Christ Nilsen was the building contractor, and Nathan Goldstone was an officer of the steel corporation which had the contract with Nilsen to furnish the steel for the erection of the structure.

McNulty acted as general manager of the corporation which owned the structure being erected. Nilsen, the building contractor, was in personal charge of the construction work, and Goldstone personally represented the corporation furnishing the steel in all matters connected with the drawing of the plans and the fabrication and delivery of the steel. Each was called as a witness against the defendant. During the redirect examination of Goldstone by the assistant district attorney, he was permitted to testify that he, the witness, the defendant Orzel, Nilsen, and McNulty appeared before the grand jury, and that the grand jury investigated the whole matter. The witness was then asked: "Q. Insofar as you know, after the Grand Jury investigated the whole thing, the only one against whom it returned an indictment for manslaughter was this defendant, is that correct? A. I think so."

The counsel for defendant objected to the line of questioning, but his objection was over-ruled. He then moved to strike out the answer. The motion was denied, with an exception. That the ruling was highly prejudicial to the defendant and presents serious error cannot be doubted. In fact, the only justification offered for the ruling is that the defendant by the cross-examination of the witness had opened the door for such examination. To that we cannot agree. It was seriously urged at the trial by the defendant that, if any one had been guilty of culpable negligence, it was not the defendant, but was one or more of the three witnesses named.

Such contention was not without some justification. Surely the witness was not competent to testify as to what took place in the grand jury room. The effect of the evidence was to convey to the jury the inference that the grand jury had investigated the conduct of the three witnesses named and had determined that each was free from fault, and that the defendant was the only person criminally responsible for the tragedy.

Various other alleged errors have been called to our attention. We do not deem it necessary to discuss them, as we feel that in a doubtful case like this we should not overlook the error already set forth.

The judgments should be reversed, and a new trial ordered.

Mr. Orzel has recently been granted a license to practice engineering by the New York State Board of Licensing for Professional Engineers and Land Surveyors.

Coleman Woodbury Made Director of Housing Officials

Coleman Woodbury has been elected executive director of the National Association of Housing Officials, according to announcement of the president of the association, Ernest J. Bohn. Mr. Woodbury is secretary of the Illinois State Board of Housing, consultant to the housing division of PWA and has long been a student of urban land problems. He directed the study leading to the enactment of the Illinois housing laws and was for some years on the staff of the Institute of Land Economics at Northwestern University.

Mr. Woodbury succeeds Charles S. Ascher, who has been executive director of NAHO since it was organized last November.

Surplus Earnings of Water Plants May be Used for City Debt

A RULING of the state attorney general permits the city officials of Carthage, Mo., to apply the surplus earnings of the municipal waterworks plant to other city use, by proper ordinance, provided that such transfer does not endanger the ability to meet all interest and principal payments on bonds issued against the utility.

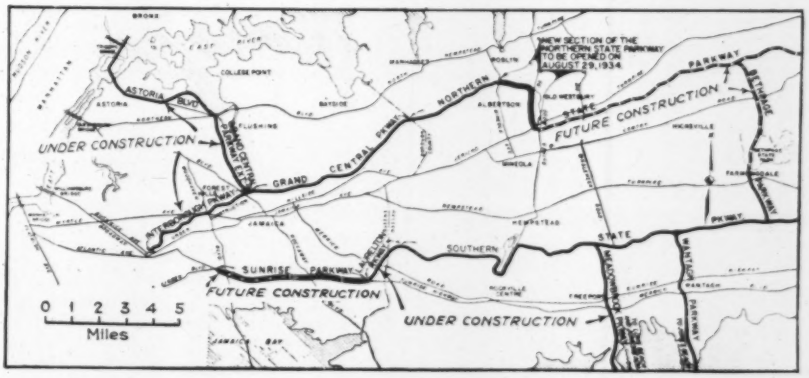
The opinion pointed out that there are no Missouri statutes or court decisions specifically authorizing the use of such surplus funds from municipally owned public utilities for other municipal purposes, neither are there any laws or rulings against such transfer. The opinion held that the owners of waterworks bonds have no cause for complaint concerning this type of transfer if interest and principal payments are met promptly.

City officials of Carthage desire to make the transfer because there are about $38,000 in delinquent taxes outstanding and many property owners may not be able to pay their taxes during the remainder of the year.

"It must not be understood that we express any approval of such action by the city or its board in charge of the waterworks as would maintain water rates at a higher rate than necessary for the purpose of raising revenue for other purposes," according to the decision, "in view of Section 7675 (Revised Statutes of 1929) which provides that the rate shall be sufficiently high to raise money for certain named purposes, and does not include any purposes other than expenses of maintenance, bond interest and retirement, but if the rates established by the city of Carthage or its duly authorized board are reasonable, and if they result in a surplus over the statutory requirements of Section 7675, we find nothing in the statutes or decisions of this state prohibiting the use of a surplus for other municipal purposes."

NEW SECTION OF LONG ISLAND PARKWAYS READY

While active construction continues on the Grand Central Parkway Extension, Interborough Parkway, Laurelton Parkway and the Meadowbrook Parkway, each an integral part of the system being developed by the Long Island State Park Commission in the New York metropolitan region, a new section of completed work is to be opened Aug. 29. This is a 3-mile extension of Northern State Parkway in Nassau County, furnishing a link with Jericho Turnpike, a wide east-and-west state road. This new section, with a four-lane concrete pavement, bordered by landscaping on each side, has a 250-ft. right-of-way. It also includes six stone-faced concrete bridges, forming grade-separations at all intersecting highways.



Tax on Engineers Suggested to Relieve Municipal Deficit

A bipartisan revenue committee of the board of aldermen of St. Louis, which was established to consider means of raising additional revenue to offset an expected deficit of about $4,500,000 for the current fiscal year, has suggested a special tax of $25 a year each for 180 architects and 2,000 local engineers, according to reports. It is believed that the estimate of the number of engineers includes a large number of railroad enginemen and hoisting engine operators.

General contractors would be taxed according to their gross annual business if the recommendations of the special tax attorney are adopted. This suggested tax schedule for contractors would range from $25 a year up to $500 a year for a firm doing more than $1,000,000 of gross business. There are about 2,400 contractors in the city and the proposed tax would produce about $95,000 annually.

Iowa City to Test Validity of Municipal Power Revenue Bonds

A ruling from the Iowa Supreme Court will be requested by Iowa City, on the validity of revenue bonds which the city proposes to issue for the construction of a municipal light and power plant to cost about $917,000. The project will be financed partly through a PWA grant. Several weeks ago the city voted 2,295 to 2,810 to approve the establishing of a municipal power plant and the issuing of revenue bonds for financing. Under a newly operative Iowa law, revenue bonds issued in connection with the construction of a municipal utility and made payable out of the earnings of the utility are not considered a general obligation on the city.

British Holding Exhibition On Telford Centenary

British engineers are now celebrating the centenary of the death of Thomas Telford, the great constructor who designed the Menai Suspension Bridge, with an exhibition of plans, drawings, portraits, and other objects associated with him. The exhibition is being held at the Institution of Civil Engineers, London, of which he was first president.

Telford, who died on September 2, 1834, was associated with John Rennie, the designer of Waterloo Bridge, in advising upon fen drainage. The exhibition is timely as recalling that close association between engineering and architectural questions in the early nineteenth century, which is only now asserting its importance again, and with renewed force.

The exhibition consists of 78 items, including a photograph of the pencil portrait of Telford in the National Portrait Gallery, London, and other interesting portraits, his private notebook on architecture, autograph letters, drawings and plans for his various works, including a proposed Clifton Suspension Bridge, and personal relics. Like Rennie, Telford, whom the poet Southey described as "Pontifex Maximus and Colossus of Roads," was a self-taught man, the son of an Eskdale shepherd.

New Jersey Flood Breaks Dams and Wrecks Bridges

(Continued from p. 189)

the raceway still served as the only outlet of Sunset Lake except for two 48-in. pipes and 50 ft. of spillway gates. Several years ago the city abandoned its artesian well supply in favor of a lake supply, taking water from the canal half a mile below the dam. From the intake water flows by gravity to a pumping station near the center of town on the west side of the river.

Late in the afternoon of Aug. 2 the dam at Bostwicks Pond, the farthest north on the Cohansey River, failed. Waters rushing into Seeley's Pond, four miles below, soon overtopped the earth dam there, causing complete failure. About the same time the dam at Silver Lake on a tributary to the Cohansey near Seeley's Pond, gave way. By the time the flood waters reached Sunset Lake, a small dam creating Mary Elmer Lake to the west of Sunset Lake failed completely, adding more water to the already full Sunset Lake. The drainage area above Sunset Lake is 46 sq.mi.

Tumbling Dam, creating Sunset Lake, is an old earth fill about 16 ft. high and 1,800 ft. long, carrying a hard-surfaced county highway. Eyewitnesses claim that by midnight a wall of water 4 ft. high was sweeping over the entire length of the dam. Shortly afterwards the dam failed in two places, one breach 100 ft. long occurring near the east end, and a main break 250 ft. wide opening up at the center. In the meantime rapidly rising waters in the raceway had damaged a concrete arch bridge at the lake outlet, and had broken through the riverside embankment of the canal in four places, causing considerable damage to park property along the canal. Waters of Jeddy's Pond, backwater from the canal, also escaped.

Bridges swept away

From the pumphouse down (see map), all the water was concentrated within the bulkhead walls of the river channel. Most fortunately for the city, the main rush of water came at low tide, and the river did not overflow its banks. Across the bulkheaded stretch of river were three bridges at Washington St.; Commerce St. and Broad St. The upstream structure was merely a foot bridge. Just below Washington St. were anchored five fishing smacks. Along with the wreckage of [illegible] foot bridge these boats were swept against the Commerce St. bridge, a 97-ft. through truss swing span resting on a circular [illegible] and set off center to permit a wide channel on one side. The combined force of water and boats tore this span loose from its [illegible] tilted the pier upstream and dropped the span into the river in a partly-open position, burying one of the fishing smacks underneath. Two of the boats were forced through the opening, and crashed against the Broad St. bridge, a deck-girder swing span 140 ft. long. This structure was carried by a center pier and two abutments, all of poorly-cemented masonry. The force of water simply disintegrated the masonry, dropping the steel span vertically for several feet, until it rested on the center pier wreckage, with the ends caught on the banks. One fishing boat was forced under the settled span, sinking some distance downstream. Just what part the boats had in the wrecking of the bridges is open to speculation. Some believe they were a direct cause of the failure of both spans; others doubt it. Both center piers were founded on grillage set on sandstone on [illegible] piles; definite information was lacking. The bridges failed early Friday morning. Later on that day the timber bulkheads gave way in several places, and, at Commerce St. in particular, caused considerable damage to adjacent buildings (see illustration).

Temporary bridges

The Broad St. bridge carried a state highway. The highway department, as the quickest means to restore traffic, built a temporary pile and timber trestle at the site of the Washington St. footbridge, opening this bridge to traffic on Wednesday. Meanwhile, army engineers had completed a pontoon structure between Commerce and Broad Sts., opening it to foot traffic Sunday morning and to vehicles later that day. Until the Washington St. trestle was opened, the pontoon bridge provided the only physical connection between the residential and business sections of the city. The state will replace the Broad St. bridge.

By 10 p.m. Friday, 22 hours after disruption of the city's water supply, two old

REPAIRING the main break in Tumbling Dam, to restore Bridgeton's water supply. Concrete structure in right foreground is headgate of two 48-in. spillway pipes.

artesian wells had been restored to service, providing 1.6 m.g.d., enough for domestic use only. One water line crossing under the river was broken, but others were ample to serve the business district. On Sunday three fire engines were pumping from the river into the water treatment works to provide additional supply. By Monday night a 2,000 g.p.m. electric pump, loaned by a glass mill, was in service pumping from the river. This provided enough additional supply to permit resumption of operations in the canning plants, dye works and glass mill, the city's main industries. The pump was mounted between two army pontoons, and pumped through a series of fire hose lines. All water was heavily chlorinated in addition to normal filtration treatment.

Early on Saturday work started in repairing the breaks in the canal bank and Tumbling dam, the former by ERA labor, and the latter by contract. The east break in the dam was soon closed, and by filling in from both ends of the large break, the dam was expected to be ready for service by Thursday of this week, six days after the flood. Some time will be required for the lake to fill to the level of the raceway outlet and thus restore normal water supply service. Plans were already under way for the installation of additional spillway capacity for Tumbling dam. The city will replace Mary Elmer dam, adjacent to Sunset lake, but has no jurisdiction over the three dams upstream. As these all carried county highways, they will undoubtedly be replaced.

Repairs to the flood damage are being carried out under the direction of J. B. Westcott, city commissioner of public works, and Edward H. Maier, city engineer.

Washington Notes

By Paul Wooton
Washington Correspondent

Sentiment among surveyors and map makers is being sounded to determine their attitude toward the organizing of a national association. One of the purposes of such an association would be to prevent too great an encroachment by the government upon the field that the private surveyors and map makers believe should be theirs. Another announced purpose is a campaign looking to the education of the public as to the practical value of adequate maps.

Plans are being drawn as rapidly as possible for the construction of a new building for the Federal Reserve Board. Since its creation the board itself has been housed in the Treasury Building. It has been necessary, however, to house most of the board's staff outside of the Treasury. The Treasury has been expanding to such an extent of late that it needs the rooms occupied by members of the board and their offices are being moved this week into rented quarters in an office building across the street from the Treasury, pending the construction of the new building.

The National Recovery Administration announced its approval of an order amending the code of fair competition for the construction industry so as to give the Code Authority power to administer the construction code in any branch of the industry for which no divisional Code Authority shall have been established.

Providence Sewage Disposal Financing Arranged

Financing for a $475,000 sewage disposal project with PWA funds by Providence, R. I., has been approved by the city finance committee, subject to final authorization by the city council. The appropriations include a PWA grant of $134,000 and a city bond issue of $340,000, no Federal loan having been obtained. It is understood that the emergency public works committee will favor a $30,000 payment to Activated Sludge, Inc., for royalty fees on the system which it is expected will be used in completing the Fields Point treatment plant.

Milo S. Ketchum Is Made Dean Emeritus at Illinois

Milo S. Ketchum, one of the country's leaders in engineering education and for ten years dean of the College of Engineering and Director of the Engineering Experiment Station at the University of Illinois, has been retired by the trustees of the University with the title of "Dean of the College of Engineering and Director of the Engineering Experiment Station, Emeritus." Dean Ketchum was presented with a hand-painted and illuminated tribute from the faculty of the Engineering College which expressed the esteem of his colleagues.

The long professional and engineering career of Dean Ketchum is well known. Briefly, he graduated from the Universcity of Illinois in 1895 and served as instructor in civil engineering for the following two years. After a brief period of professional work with steel companies, he served as professor and dean of civil engineering at the University of Colorado from 1905 to 1919, when he left to become head of the civil engineering department at the University of Pennsylvania. In 1922 he returned to the University of Illinois.

Personals

EDWARD PIERCE has been appointed highway engineer of Menominee County, Mich., to succeed M. R. Jensen, resigned.

PAUL E. GREEN, chief engineer for the Illinois PWA work, has completed his duties for the administration and returned to private consulting practice in Chicago.

JOHN BARTH, formerly assistant to the engineer of La Crosse, Wis., has been named acting city engineer of that city to succeed the late J. T. Hurd.

IRA D. KELLY resigned his position as bridge designer with the Kansas Highway Commission to accept the position of structural designer with the North Dakota State Highway Department at Bismark.

PATRICK PHILLIPS, for the past 12 years deputy minister of public works and chief engineer for the Province of British Columbia, has left the department. ARTHUR DIXON, district engineer, will become deputy minister.

W. V. BUCK has resigned the position of chief engineer of the Kansas state highway commission to become supervising engineer for the U. S. Bureau of Public Roads, in Ohio.

H. D. BARNES has been named chief engineer of the Kansas state highway commission to succeed Mr. Buck. Mr. Barnes graduated from Kansas State College and has been with the department since 1920.

JOHN S. HAMILTON, for several years research assistant at the Engineering Materials Laboratory, University of California, is now with the Bureau of Reclamation at Denver in the concrete research laboratory.

GRANVILLE G. PAYNE has been appointed city engineer and water superintendent of Everett, Wash., to succeed Olin M. Sprague. E. H. KENTON has been appointed assistant to the engineer. The new city engineer has been with the city water department since 1922.

CHARLES P. CASEY has been appointed assistant director of the Department of Public Works and Buildings for Illinois by the Governor to fill a vacancy which has existed for about a year.

SAMUEL VALENSTEIN is resident engineer-inspector for the PWA at Wolcott, N. Y., supervising the Leavenworth Central School. Mr. Valenstein was formerly chief engineer of M. Shapiro Son, New York.

H. W. YEO, formerly at the Parker Creek Experiment Station of the U. S. Forest Service at Globe, Ariz., is now engineer at the Navajo Experiment Station of the Soil Erosion Service. Mr. Yeo is a former state engineer of New Mexico.

JOHN B. LEONARD, for six years Superintendent of the Bureau of Building Inspection, San Francisco, retired July 31. In addition to his official position Mr. Leonard was chairman of the building code committee of the local Am.Soc.C.E. sections, and vice-president of the Joint Uniform Building Code Committee. As superintendent of the San Francisco building department he has been active in the recent revison of state laws for promoting earthquake resistance construction.

PAUL D. SARGENT, for several years chief engineer of the highway commission of Maine, has opened an office in Boston, Mass., to promote the market for corrugated metal, pipe culverts and drainage structures throughout New England. He has been identified with the New England Metal Culvert Co. since 1929.

DEXTER P. COOPER, for many years interested in tidal power development plans at the mouth of the Bay of Fundy, has re-established his home at Campobello, N. B., after spending several years with his brother, Hugh L. Cooper, on the Dnieprostroy hydroelectric development in Russia, followed by additional work in other parts of Europe.

C. H. TORNQUIST, formerly superintendent of hydroelectric work for the Phoenix Utility Co., New York, and more recently construction superintendent, U. S. Engineer's Office, Fort Peck Dam, has been selected by the Bureau of Reclamation to take charge of power plant equipment installations at Boulder Dam.

KENNETH WILLIAMS has been appointed manager of sales for the engineering and construction department of Byllesby Engineering & Management Corp. This department of the Byllesby organization, which has for some years confined its services to the subsidiaries of the Standard Gas & Electric Co., is expanding its activities to include general engineering practice for independent plants. It is this particular phase of the corporation's activities in which Mr. Williams will be engaged.

GEO. S. YEOMANS, OTTO R. DREWS and MITCHELL T. BRADLEY are, respectively, president, secretary and treasurer of the new organization, Yeomans-Drews Cor-

poration, engineers and contractors, Jersey City, N. J. The organization will continue in foundation and heavy construction work which has been followed by the personnel for many years.

Obituary

AMBROSE V. ROCHE, consulting engineer of St. Louis, died in that city on July 29 at the age of 49. Previously, Mr. Roche had been with the Union Electric Light & Power Co. in the capacity of industrial engineer.

HENRY P. F. WILKINS, manager of the Marblehead (Mass.) water department for 25 years, died in that town July 22. He had been connected with the department about 45 years. At the time of his death he was chairman of the town sewerage commission and had previously served on the municipal electric light board.

G. CLINTON UHL, chairman of the Maryland State Roads Commission, died at his home at Mount Savage, August 4, at the age of 63. Mr. Uhl was appointed to the Roads Commission in 1916, and in 1929 he assumed the chairmanship after a reorganization which followed the resigning of John N. Mackall, the combined chief engineer and chairman.

JOHN C. WUELLNER, building contractor of Alton, Ill., and member of the Divisional Code Authority for General Contractors in that state, died August 2 in a hospital at Milwaukee, Wis., at the age of 49. He was a former president of the Associated Contractors of Illinois, and had built numerous hospitals and institutional buildings in Illinois and Missouri.

WARREN R. KING, district engineer, U.S.G.S., at Chattanooga, was killed in an automobile accident Aug. 1. For nearly twenty years he handled all stream gaging on the Tennessee River and the principal tributaries of that stream on which plans for projects being carried out by TVA were based. He was considered a leading analyst of Southeastern rainfall and stream flow conditions. He graduated from the engineering department of the University of Utah.

FREDERICK A. SCHRADER, who had been connected with John Monks & Sons, New York City, for 37 years, and was well known in the field of heavy construction work in the East, died in Brooklyn August 1, at the age of 67. Mr. Schrader was born in Germany. During the war he was in charge of building the Hog Island shipyards for the Emergency Fleet Corp. and had also been connected with bridge work for the Baltimore & Ohio Railroad over the Susquehanna River. He had also superintended several heavy construction projects in South America.

ROBERT B. DAVIS, formerly designing engineer for the Boston Elevated Ry. and actively identified with the construction of that rapid transit system, died at Chatham, Mass., July 31, at the age of 79. He was a graduate of New York University and for several years served as assistant to the division engineer of the West Shore & Buffalo Railroad. Later he became principal assistant engineer of the Brooklyn Elevated R.R., and then manager of the bridge and construction department of the Pencoyd Iron Works, Philadelphia. He became connected with the Boston Elevated Ry. about 1900.

CONSTRUCTION STATISTICS OF THE WEEK

LOW public works awards bring this week's engineering construction total down to $15,404,000 of which $4,641,000 is for federal work, $7,995,000 for state and municipal and $2,768,000 for private work. This total is only 4 per cent over the average August week last year.

Both street and roads and public buildings classifications are at record lows for the year, the former at $2,845,000 for the week and the latter at $1,463,000, the second lowest week this year. Earthwork, irrigation and drainage, at $4,448,000 are higher for the week, commercial buildings at $2,070,000 are higher and industrial buildings at $511,000 are lower than a week ago.

Larger projects for the week include a highway letting by Missouri, $447,000; the powerhouse substructure including excavation and removal of cofferdam at Bonneville Dam, Oregon, $3,896,000; and track materials for the Board of Transportation, New York City, $490,000.

New capital for the week consists solely of state and municipal bond sales totalling $7,178,000, an increase of 27 per cent.

CONTRACTS

(Thousands of Dollars)

	Weekly Average Week Aug. 1933	Prev. 4 Weeks	Aug. 9 1934
Federal Government	$600	$10,398	$4,641
State and municipal	7,300	16,180	7,995
Total public	$7,900	$26,578	$12,636
Total private	6,913	4,494	2,768
Week's total	$14,813	$31,072	$15,404
Cumulative to date:			
1933	$521,796	1934	$784,203

NEW PRODUCTIVE CAPITAL

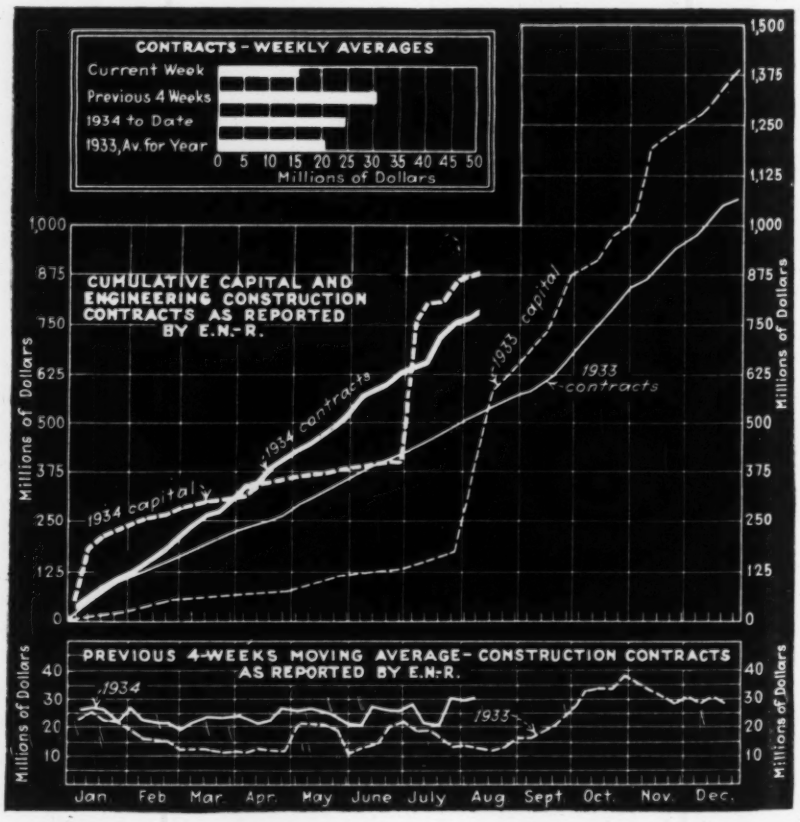
(Thousands of Dollars)

1934	Week Aug. 9	Cumulative
State and municipal	$7,178	$220,922
PWA allotments, S&M.	.....	577,214
RFC loans, S&M	....	9,463
Corporate issues	.....	17,063
PWA allotments, private	.....	54,672
Total, Non Federal	$7,178	$879,334
PWA allotments Federal Constr.	.....	180,442
Total new capital	$7,178	$1,059,776
Cumulative to date:		
1933	$480,193	1934 $879,334

NOTE: These figures include private bonds, and stocks sold for productive purposes; state and municipal bonds for construction; PWA loans and grants to states and municipalities, including the special highway funds; PWA private loans, and allotments for Federal construction.

INDEX NUMBER

E.N.-R.- Cost	1913 = 100	1926 = 100	E.N.-R.- Volume	1913 = 100	1926 = 100
Aug., 1934	**198.40**	**95.37**	**July, 1934**	**128**	**56**
July, 1934	199.65	95.97	June, 1934	119	50
Aug., 1933	167.00	80.27	July, 1933	65	28.5
1933 (Av.)	170.18	81.80	1933 (Av.)	102	45
1932 (Av.)	156.97	75.45	1932 (Av.)	127	56
1931 (Av.)	181.35	87.17	1931 (Av.)	220	96.5



CONSTRUCTION REPORTS

WATERWORKS

PROPOSED WORK

Ark., Eureka Springs—Mayor plans improving waterworks systems, incl. installing tank. Est. $18,000. P.W.A. project. E. M. Rathff, Fayetteville, engr.

Ark., Kensett—T. J. Pryor, mayor, plans waterworks system. Est. $43,000. P.W.A. project. H. R. Carter, Natl. Standard Bldg., 312 Center St., Little Rock, engr. Noted June 13.

Ark., Leachville—Mayor plans waterworks system. Est. $45,000. Approved by Washington P.W.A. T. H. Allen, McCall Bldg., Memphis, Tenn., engr.

Ark., Pocahontas—J. E. Burrow, mayor, soon takes bids complete waterworks system. Est. $32,000. Dickinson & White, Rector Bldg., Little Rock, engrs. P.W.A. project approved.

Ark., Tuckerman—Mayor plans waterworks system. Est. $50,000. P.W.A. project approved. F. A. Pritchett, Wallace Bldg., Little Rock, engr. Noted May 25, 1933

Calif., Roseville—City Council votes to purchase existing water system of Public Utilities California Corp., for $185,000 and plans constructing extensions, thereto. $200,000 bonds voted to finance same. Noted Mar. 1.

Calif., Santa Barbara—City, V. E. Trace, water supt., City Hall, election Aug. 28, $300,000 for municipal water system improvements, incl. construction of reservoir and reforestation of entire city watershed. Noted June 21.

Calif., South Pasadena—City plans waterworks, incl. 250,000 gal. capacity steel water tank on Raymond Hill, laying 10,000 ft. 10 in. c.i. water pipe and installing 2 booster pumps. J. James, City Hall, engr.

Colo, Colorado Springs—City Council, E. Mosley, city mgr., F. O. Ray, city engr., preliminary plans completed and soon takes bids 900 ft. long dam across Crystal Creek on north slope Pike's Peak to make 1,000,000,000 gal. reservoir. Part of $1,250,000 water system, P.W.A. project. D. C. Henny, consult. engr.

Ill., Lansing — Village plans 500,000 gal. rein.con., reservoir, 12 in. c.i. watermains, $60,000. Consoer, Towson, Older & Quinlan, 1205 West Wacker Dr., Chicago, Ill., engrs. Noted Apr. 12.

Ky., Pineville—Kentucky-West Va. Utilities Co., Pineville, plans filtration plant. To exceed $25,000.

Mass., Barnstable—Town voted $100,000 for construction of water system for Barnstable Fire Dist, C. Jones, chn. of Special Water Comn.

Mo., Lee Summit—City plans 7 mi. pipe line from Lake Totawana to Lee Summit. Engineer not appointed.

Mont., Culbertson—City plans waterworks improvements. $59,000. **P.W.A.** R. N. Stewart, Miles City, engr.

Mont., Eureka—City, waterworks replacements, incl. 11,300 lin.ft. 6 in. and 5,040 lin.ft. 8 in. c.i. pipe; 500 ft. 8 in. wood and 400 ft. 10 in. wood pipe. $30,000. R. J. Hale, city engr. Noted Feb. 8.

Mont., Fairview—City plans one 10 in., 80 ft. deep well and pumping equipment, 10,448 cu.yd. excav., 100,000 gal. elevated tank, 26 hydrants, 32 gate valves, 22,720 lin.ft. 4- to 8-in. c.i. pipe. $48,000. R. N. Stewart, Miles City, engr. Noted Nov. 9.

Mont., Thompson Falls—City voted bonds complete waterworks system. A. L. Anderson, city mayor. Noted May 17.

N. J., Bayonne—Bd. City Comrs., plans waterworks, $600,000. P.W.A. funds allotted. W. L. Clarkson, city engr. Noted Jan. 11.

N. J., New Brunswick—City bids early in September, water supply system. $355,000. $225,000 funds allotted by P.W.A. Asher Atkinson, city engr.

N. J., Ramsey — Boro, bids in September, mains for water supply $2,700. **P.W.A.** J. A. Conklin, boro engr.

N. M., Silver City — City, plans improving water system, and septic tank and sewerage system additions. $49,000. P.W.A. funds allotted. Burton G. Dwyre, Silver City, engr. Noted Dec. 7.

N. Y., Naples — Village plans enlarging municipal water supply, incl. enlargement of reservoir at Ingleside; constructing new catch basin and piping supply to village mains. $5,000. Engineer not appointed.

O., Holland—City plans waterworks, incl. 10,000 ft. 4- to 8-in. c.i. pipe 36 valves, 20 fire plugs or hydrants, two 75 g.p.m. turbine or vertical centrifugal well pumps and motors, one 100,000 gal. capacity steel tank, two 12 in. wells, 100 ft. deep, two 10x10 ft. well buildings. Est. $33,000. G. Champe & Associates, Nicholas Bldg., Toledo, engrs. Project now before P.W.A. at Washington. Noted Apr. 26.

Okla., Blackwell—City plans water supply dam pipe line and filter plant. $100,000. Burns & McDonnell, Linwood Blvd., Kansas City, Mo., engrs. Noted July 5.

Okla., Hobart—City plans 27,000 ft. 24 in. wrought iron emergency supply line for water supply. $6,000. Private plans.

Ore., Astoria—City soon takes bids concrete dam, for additional storage, above main waterworks dam on Bear Creek. $10,500. G. Garrett, city engr.

Pa., Shenandoah—City plans impounding reservoir. Est. $100,000. C. E. Myers, Lincoln-Liberty Bldg., Phila., engr.

Tenn., Camden—City, plans waterworks, etc. P.W.A. granted $46,000 loan for same. J. A. Switzer, Engineering Bldg., Knoxville, engr.

Tenn., Fayetteville—City, plans waterworks and sewers. P.W.A. granted $11,000 loan. J. A. Switzer, Engineering Bldg., Knoxville, engr. Noted July 12.

Tenn., Nashville—City plans waterworks extensions. P.W.A. granted $300,000 loan. R. L. Lawrence, Jr., ch. engr. Waterworks.

Tenn., Trimble—City, plans waterworks. P.W.A. granted $30,000 loan. T. H. Allen, 65 McCall St., Memphis, engr.

Tex., Burnet—City, c/o W. G. Golloway, mayor, plans waterworks. P.W.A. approved $46,000 allotment. J. W. Beretta, Engineers Inc., Natl. Bank of Commerce Bldg., San Antonio, engrs. Noted Oct. 26.

Tex., Marble Falls—City, c/o Secretary, plans complete waterworks system, incl. pump station, purification plant and distribution system. $43,000 allotment approved by P.W.A. H. R. F. Helland, First Natl. Bank Bldg., San Antonio, engr. Noted Aug. 10, 1933.

Tex., Morton—City plans waterworks system, incl. well supply and electric light plant and distribution system. $23,000 allotment approved by P.W.A. H. N. Roberts, Lubbock, engr. Noted Oct. 12.

Tex., Naples—City plans complete water distribution system and sewage disposal plant. $45,300 allotment approved by P.W.A. F. R. Cromwell, Naples, engr. Noted Oct. 19.

Tex., Weimar—City, c/o H. Laas, mayor, voted $2,000 water well and pumping equipment, probably electrically driven. E. Fahrethold, Weimar, engr. **P.W.A.** Noted Aug. 2.

Utah, Eureka — City plans replacing watermains, with c.i. pipe, new concrete reservoir. $50,000. P.W.A. funds granted. Caldwell & Richards, Templeton Bldg., Salt Lake City, engrs. Noted Apr. 16, 1933.

Man., Winnipeg—W. P. Brereton, city engr. soon takes bids constructing waterworks operating building. $30,000.

Ont., Sault Ste. Marie—Town making plans sinking deep well for water supply to replace present supply from St. Marys River. Test holes have been sunk. $10,000. James Proctor & Redfern, 36 Toronto St., Toronto, engrs.

BIDS ASKED

Ala., Springville—Aug. 15, by Town, pump, motor, springs, elevated tank, distribution mains, meters, service connections. $24,000. John M. Gilfillan & Associates, 617 North 10th St., Birmingham, consult. engrs. Noted Feb. 8.

Ind., Hammond—Dpt. Waterworks, bids about Aug. 15, water filtration plant, 16 in. drain pipes, 36 in. sewer pipes, concrete reservoir, filtration equipment; three 48x24 sluice gates, mixing basins. $700,000. **P.W.A.** Greeley & Hanson, 6 North Michigan Ave., Chicago, Ill. engrs.

Mass., Boston—Aug. 16, by City, Dpt. P. Wks., C. J. Carven, comr., 508 City Hall Annex, furnishing, laying and relaying c.i. water pipe lines in Forest Hills and Sigourney Sts., Glen Rd. and Walnut Ave., West Roxbury and Roxbury. To exceed $25,000. This is part of $1,000,000 P.W.A. loan and grant.

Section Index

Engineering Structures:

Bridges and Grades Crossings 31
Earthwork, Irrigation, Drainage and Waterways 33
Foreign 34
Materials and Equipment 33
Streets and Roads 31
Sewerage and Waste Disposal 30
Unclassified 33
Waterworks 29

Buildings:

Public 34
Commercial 36
Industrial 36

Federal Government projects are classified under heading denoting type of work and designated by symbol of †

◆

Mich., Wyandotte—Aug. 13, by Municipal Service Comn., Van Alstyne Blvd., furnishing and installing electric motor driven centrifugal pumps, 1 pump with 1,500 g.p.m.c. and 1 pump with 1,800 g.p.m.c., pipe connections and specials. $13,000. Former bids rejected; bids same date, labor, material and foundation for elevated steel water tank, incl. concrete foundpiers and central pipe tunnel and gallery. 300 cu.yd. excav., 210 cu.yd. concrete, 13 Cwt. reinforcing steel, 1 manhole and cover. Est. $5,000. Pate, Hamann & Hirn, 1610 Washington Blvd. Bldg., Detroit, engrs. Noted July 12.

Mich., Wyandotte—Aug. 20, by H. E. Allen, supt., Municipal Service Comn., furnishing and installing pumphouse floor, pipe, pipe fittings, specials, venturi meter, valves, pressure gages, remote control, electrical equipment, pump connections, etc., in connection with waterworks plant extensions. Pate, Hamann & Hirn, 1610 Washington Blvd. Bldg., Detroit, engrs.

N. Y., Willard—Aug. 15, by Dpt. Mental Hygiene, State Office Bldg., Albany, water softening apparatus, addition to power plant at Willard State Hospital.

N. C., Rocky Mount—Aug. 16, by L. B. Aycock, city mgr., water purification plant, brick bearing, 1 and 2 stories, 50x60 ft. and 35x80 ft. buildings, 1st floor plain concrete, 2nd and 3rd floors rein.con., incl. 1 m.g.e. steel elevated reservoir storage tank, steel tower, pipe, water mains, fire hydrants, etc. W. C. Olsen, Raleigh, engr. Noted June 7.

Okla., Nowata—Sept. 3, by E. Young, city mgr., filter plant additions, extending mains and repairing waterworks. $21,000. Black & Veatch, 700 Mutual Bldg., Kansas City, Mo., engrs. **P.W.A.** Noted Aug. 2.

Pa., Reading—Aug. 22 by City Clerk, Contr. 63, raising concrete spillway for Ontelaunee Dam, involving constructing rein.con. arch bridge across spillway, all excavation, backfill, embankment, concrete work, flagstone sidewalk, miscellaneous structures, etc., located across Maiden Creek, 14,000 ft. above its confluence with Schuylkill River, west abutment about 1 mi. northeast of State Hy. Route 120. A. R. O'Reilly, ch. engr. Bureau of Water; adv. E. N.-R. Aug. 9.

Tex., Arp—Aug. 20, by City, c/o R. E. A. Fosdick, mayor, complete new waterworks system, incl. deep well, elevated tank, pipe lines. Est. $7,500. P.W.A. project. J. Rady, 400 Majestic Bldg., Fort Worth, engr. Noted July 26.

Wash., Chehalis—Aug. 15, by City Comrs., constructing 53,500 ft. 16 in. and 53,500 ft. 4- to 14-in. pipe for municipal water system. $132,739. Bonds authorized.

CONTRACTS AWARDED

Calif., Porterville—City, drilling new water well in West Orange St., near F St., to M. Clive, 209 West Clive St. Noted May 24.

Calif., San Francisco—S. J. Hester, secy., Dpt. P. Wks., installing Line No. 2, Sect. "A" Potrero Dist., extension to auxiliary watersupply system, 8 to 16 in. c.i. pipe furnished by City to be installed, to H. Lawson, 465 Tehama St., $28,748. Bids July 18, awarded Aug. 2.

†*Federal Government.*

For official proposal advertising see Searchlight Section

Constr. News page 53

Waterworks (Continued)

Colo., Colorado Springs—City Council, E. Mosley, city mgr., F. O. Ray, city engr., 2 concrete intake dams and encasing 1,100 lin.ft. 24 in. pipe line in concrete, to R. C. Whitlock, Colorado Springs, $18,430. Part of $1,250,000 water system work. **P.W.A.** Noted Apr. 5.

Colo., Ordway—City Manager, 56,300 ft. 8 in. composition asbestos and cement pipe, to Crane-O'Fallon Co., Pueblo, $35,000. **P.W.A.**

Colo., Ouray—City Council, F. A. Rice, mayor, pipeline equipment, pipe, to Grimes Pipe & Supply Co., 1300 Lorimer St., Denver***valves and fittings, to Biggs-Kurtz Hardware Co., Grand Junction. City to install.

Ill., Hardin—City, c.i. pipe, specials, hub and gate valves, end valves, fire hydrants, copper tubing, service connections, water meters, tank on tower, well drilled and cased, well screen and fittings, concrete pump house and standpipe, deep well turbine pump, to E. J. Fischer, 4134 Westminster Pl., St. Louis, Mo., $37,227. **P.W.A.** Bids July 20.

Ill., Mount Sterling — City, earthern dam, spillway, intake tower, purification plant, watermain extensions, to Cameron Joyce Co., Keokuk, Ia., $63,248. **P.W.A.** Bids July 26, awarded July 27.

Ia., Shenandoah—City, constructing water treating plant and pumping station, to Olson Constr. Co., Lincoln, Neb., $57,251***piping, valves, fittings, drainage, plumbing systems, to Economy Plumbing & Heating Co., 1308 South Crawford Ave., Chicago, Ill., $43,396***furnishing and installing pumping equipment, appurtenances and station light and power wiring systems, to Electrical Equipment Co., 207 Grand St., Des Moines, $17,905***elevated tank, to Pittsburgh-Des Moines Steel Co., 1015 Tuttle St., Des Moines, $3,850. Grand total $122,956. **P.W.A.** Bids July 23, awarded July 30. Noted July 12.

Mass., Boston—City, Dpt. P. Wks., C. J. Carven, comr., City Hall Annex, furnishing, laying and relaying c.i. watermain in Arborway from Pond to Forest Hills Sts., West Roxbury, to A. G. Tomasello Sons, Inc., 250 Stuart St., $228,345. P.W.A. project. Bids July 16, awarded July 27. Noted July 12.

Mass., Paxton — Town, Bd. Water Comrs., Town Hall, constructing 25 ft. diam., 100 ft. high steel standpipe, to Pittsburgh-Des Moines Steel Co., Neville Island, Pittsburgh, Pa., $9,980. Bids July 26, awarded July 31. Noted July 19.

N. Y., East Rochester — Village, drilling 2 permanent underground well units and pumping equipment to Layne New York, Inc., 92 Liberty St., New York, $22,200. **P.W.A.** Bids July 23. Noted July 19.

N. Y., Guilderland—Comrs. Health, State Office Bldg., Albany, water supply for State Laboratory farm to V. Sollectio, Amsterdam, $14,618. Bids July 3. Noted June 28.

N. Y., Pelham — Village, laying mains for waterworks to DeMarco & Sugretto, White Plains, $61,879***c.i. pipe to U. S. Pipe & Fdry. Co., Birmingham, Ala., $46,311***meters to Pittsburgh Equitable Meter Co., 50 Church St., New York, $4,491. Grand total $112,681. Bids Apr. 19. Noted Apr. 12.

N. Y., Rome—Dpt. Mental Hygiene, State Office Bldg., Albany, waterlines and sewers to Mondo Constr. Co., 417 South Townsend St., Syracuse, $1,500.

N. D., Killdeer—City, constructing waterworks improvements, incl. watermains, hydrants, pumphouse, two 8 in. wells, 2 deep well turbine pumps, to J. A. Shaw Constr. Co., 1041½ Bway., Fargo, $28,428. **P.W.A.** Bids July 16.

Okla., Ponca City—City, cleaning lake and constructing dams and bridges for Turkey Creek Project, to M. E. Gillioz, Monett, $9,000 and $176,305 respectively***pipe lines, to Smith Bros., Walsix Bldg., Kansas City, Mo., $77,950***filter plan, to Hill & Evans, Fort Smith, Ark., 142,962***motor driven pumping unit, to Worthington Machinery Corp., 424 Boulder St., Tulsa, $2,942. Grand total $409,159. **P.W.A.** Bids July 23. Noted Aug. 2. (**Correction-cost.**)

Tex., Amarillo—R. D. Rodgers, city mgr., waterworks extensions, involving laying 20 in. mains, and completion of 5 m.g. reservoir, 210 ft. long, 20 ft. deep, to Panhandle Constr. Co., Lubbock, $177,923, est. $186,000. P.W.A. project. Noted June 28.

SEWERAGE AND WASTE DISPOSAL

PROPOSED WORK

Ala., Talladega—City rejected bids July 25 sanitary sewer and sewage disposal plant, incl. Imhoff tank and sludge bed, sludge pump with motor, wire fence, 275 ft. 12 in., 3,907 ft. 18 in. and 2,216 ft. 24 in. terra cotta pipe, 22 manholes, 5 cu.yd. B concrete, in headwall and wingwall, 12 ft. 24 in. corrugated metal pipe, one 24 in. drainage gate, etc. Est. $27,000. Will readvertise. Noted July 12.

Constr. News page 54

Ark., West Memphis—W. H. Hundhausen, mayor, plans constructing sewerage system. Est. $62,000. P.W.A. project approved. M. C. Bauman, West Memphis, engr.

Calif., San Francisco—W. H. Worden, dir. P. Wks. for City and County of Francisco, names following engineers as consultant engineers in connection with proposed sewage disposal plants at Baker's Beach and the Marina, H. P. Eddy, 1300 Statler Bldg., Boston, Mass.; C. H. Hyde, prof. of sanitary engineering, University of California, Berkeley; L. B. Reynolds, professor of sanitary engineering, University of Stanford, Palo Alto, C. C. Kennedy, Call Bldg., San Francisco.

Conn., Tarriffville—Town plans sewage pumping station, Elm St. $25,000.

Ill., Chicago—Bloom Twp., Sanitary Dist. plans intercepting sewers and disposal plant, $275,000. Greeley & Hanson, 6 North Michigan Ave., engrs. **P.W.A.**

Ill., Rochelle—City plans mechanical aeration method activated sludge type sewage treatment plant, $71,000. **P.W.A.** Suhr, Berryman, Peterson & Suhr, 130 North Wells St., Chicago, engrs. Noted Jan. 11.

Ill., Waukegan—City plans sewage treatment plant, pumping station, treatment works, oil and grease basins, grit basin settling tanks, $985,000. P.W.A. funds granted. Greeley & Hansen, 6 North Michigan Ave., engrs. Noted June 22.

Ind., Edinburg—City plans sewer system. C. H. Hurd, 1039 Architects Bldg., Indianapolis, engr.

Ia., Iowa City—City soon takes bids sewage disposal plant, auxiliary piping, $517,000 allotted by P.W.A. Currie Eng. Co., Webster City, engrs.

Kan., Hutchinson—City plans 18 in. storm sewers. Est. $115,000. P.W.A. approved loan and grant. B. Lee, Hutchinson, engr.

Md., Annapolis — Metropolitan Sewerage Comn., Municipal Bldg., storm water sewers, Contr. 10, involving 266 lin.ft. 15- to 24-in. vitr. pipe, 232 ft. 30 in. rein.-con. drains, manholes, storm water inlets, etc. Whitman, Requardt & Smith, Charles and Biddle Sts., Baltimore, engrs. P.W.A. project.

Mass., Boston—City, Dpt. P. Wks., C. J. Carven, comr., City Hall Annex, rejected bids concrete or vitr. clay pipe sewerage lines in Hyde Park Ave., Hyde Park and West Roxbury; also in Walk Hill St., West Roxbury. **P.W.A.**, Will be readvertised.

Mich., Monroe—City plans sewage disposal plan with concrete connecting sewer and outlet section. Est. $533,000. P.W.A. loan and grant approved. Shoecraft, Dury & McNamee, Ann Arbor, engrs.

Mich., Muskegon—City, plans sewage disposal plant on Muskegon Lake with interceptor sewer along shore of bay. Est. $500,000. P.W.A. loan and grant approved. Shoecraft, Drury & McNamee, Ann Arbor, engrs.

Mich., Richmond—Plans prepared for sewage disposal plant. $38,000 loan and grant approved. Shoecraft, Drury & McNamee, Ann Arbor, engrs.

N. J., Newark—Passaic Valley Sewer Comn., 20 Branford Pl., Newark, plans pumping plans and sedimentation basins in various municipalities in North Jersey. $800,000. J. R. Van Duyne, 20 Branford Pl., ch. engr.

†**N. Y., Amagansett**—Aug. 10, by Yards & Docks, Navy Dpt., c/o Public Works Office, Navy Yard, Brooklyn, rein.-con. septic tank and tile disposal field, Spec. 7714.

Ore., Portland—City plans intercepting sewers and disposal plant. $6,000,000 voted. $2,240,000 P.W.A. funds allotted. Total $8,240,000. R. G. Apperson, city engr. Noted June 28.

Tenn., Nashville—City, plans incinerators, P.W.A. granted $100,000 loan. C. N. Harrub, 711 American Natl. Bank Bldg., Nashville, engrs.

Tex., Fort Worth—City, c/o G. D. Fairtrace, mayor, plans sewage disposal plant improvements, $519,000 allotment approved by P.W.A. Hawley, Freese & Nichols, Capps Bldg., engrs. Noted Dec. 28.

Tex., Houston—City plans 90,000 ft. 42 in. concrete sanitary sewer extensions. Est. $403,000. P.W.A. loan granted. J. M. Nagle, City Hall, dir. P. Wks., engr.

Tex., Naples—See "Waterworks."

Wis., Minocqua—Town plans sewage disposal plant and sewers, trinkling filter type plant, 8 in. vitr. tile sewer pipe system. $53,500. P.W.A. funds granted. Suhr, Berryman, Peterson & Suhr, 130 North Wells St., Chicago, Ill., engrs. Noted Aug. 24.

BIDS ASKED

Calif., Los Angeles—Aug. 22, by Bd. P. Wks., Terminal Island, outfall sewer force main, clarifier connection, incl. constructing **(1a)** 420 ft. 30 in. **(1b)** 82.74 ft. 20 in., **(2)** 878 ft. 30 in. c.i. pipe sewer, (2 alt.) 856 ft. 30 in. vitr. clay extra heavy sewer; **(3a)** constructing 972 ft. 30 in. creosoted wood stave pipe outfall sewer, **(3b)** 28 ft. 30 in. c.i. pipe sewer, **(4)** alt. to 3a and 3b) constructing 1,000 ft. 30 in. c.i. outfall sewer. Est. to exceed $17,750.

Conn., New Canaan—Aug. 15, by City ... structing sewer extension and small pu... station. L. B. Sutton, warden. Noted Ju...

La., Shreveport—Aug. 15 (extended ... by G. W. Hardy, Jr., Shreveport, new ... ipal incinerator plant. Est. $75,000 ... Olachner, Shreveport, archt. Noted July ...

New York—Aug. 17, by Westchester ... Sanitary Sewer Comn., County Bldg., ... Plains, constructing Sections E-1, E-2, ... North Yonkers Project, W. W. Young, ... Martine Ave., White Plains, consult. en...

N. Y., Brooklyn—Aug. 15, by R. V. In... pres. Brooklyn Boro, Boro Hall, sewers in ... Hy., Gravesend, Neck Rd., East 57th and ... 89th Sts., Avenues J and O.

N. Y., Great Neck—Aug. 11, by V... Village Hall, treatment plant, pumping ... ment and structures, sewers. $569,100. P.W.A.

N. Y., Long Island City—Aug. 13, by ... Harvey, pres. Queens Boro, Queens ... Bldg., sewers in 109th Dr., 109th and ... Rds., Farmers Blvd., Hempstead and ... Aves., 86th, 140th, 147th, 149th, 109th, ... 198th, 199th, Dunkirk, Newburg Sts.

O., Bowling Green—Aug. 14, by E. J. Bo... dir. Public Service, sewage disposal ... sewer outfall and interceptor, sewage pum... equipment, 83,000 cu.yd. earth and 180 ... rock in open channel excav. Est. $250,... A. H. Smith & Niles, Toledo, engrs. P.W.A. project.

Okla., Oklahoma City — See "Cont... Awarded."

Pa., Pittsburgh—Aug. 20, by R. Neff, ... 501-A City County Bldg., 2 municipal in... erator plants, excluding mechanical trades ... burning of rubbish and garbage at same ... "A" plant 600 tons per 24 hr. capacity, 4 ... nace unit at Chateau and Ridge Ave., N... Side and plant "B" 300 tons per 24 hr. capacity ... at site of Brilliant Pumping Station, 12th W... 2 furnace unit. Est. $875,000. G. W. S... ler, City County Bldg., supt. engr. Bureau of Sanitation for City. Noted Apr. 26.

S. C., Columbia—City Council and Mayor L. B. Owens take bids about Aug. 26, vitr. ... or concrete sewers, Sect. 3 of extension ... Rosewood Dr., Shandon Annex, South Shando... and in Rose Hill, incl. 107,600 ft. 8- to 18-in. pipe, est. $74,000; Sect. 2 of sewer extens... in Forest Hills and Kilbourne Park, involving 110,100 ft. 8- to 18-in. pipe, est. $76,000. W. S. Tomlinson, City Hall, engr.

Tex., Dallas—Aug. 15, by City Council, sanitary sewers in Oak Lawn Park, Hood to Turtle Creek Blvd., Hortense St. from main line to city limits, Comal St., Cliff St. to Fleming Ave., Dodd St. to Hutchins Ave. City Engineer, engr.

CONTRACTS AWARDED

Calif., Redlands—At office C. H. Purcell, engr., State Bldg., Los Angeles, constructing 1,513 lin.ft. rein.-con. box storm drain, involving 10,350 cu.yd. structural excav., 1,687 cu.yd. "A" cement concrete structures, 278,000 lb. reinforced steel, to Miracle Co., 4751 Monroe Ave., San Diego, $36,128. Bids July 19, awarded July 28.

Calif., San Francisco—S. J. Hester, secy. Dpt. P. Wks., concrete sewer and appurtenances, Brannan St. from 9th St. to Center Pl. and 8th St. between Bryant and Brannan Sts., involving 661 lin.ft. 3 ft. 4 in. x 4 ft. x 6 in. rein.-con. sewer, 896 lin.ft. 3 ft. x 6 ft. rein.-con. sewer, 26 lin.ft. 6 in. circular sewer, to H. Macdonald & Kahn, Financial Center Bldg., $245,543. Bids July 18, awarded July 19.

Kan., Manhattan—City, 2,600 ft. concrete main, and clay pipe laterals for storm sewer, to H. J. Hall, Manhattan, $33,673. Noted July 19.

Kan., Moundridge—City Clerk, sewage disposal plant and sanitary sewerage system, to Dobson, Humphreys & Carter, Wichita, $19,368 and $27,023 respectively. P.W.A. project. Bids July 31. Noted July 19.

Md., Annapolis—City, Municipal Bldg., constructing and equipping complete incinerator plant, to Pittsburgh-Des Moines Steel Co., 1015 Tuttle St., Des Moines, Ia., $41,500. Bids July 7.

Mass., Boston—Dpt. P. Wks., C. J. Carven, comr., City Hall Annex, concrete pipe sewerage lines in Ashmont St. between Adanac and Neponset Aves., Dorchester, to T. G. O'Connell, 75 Claymoss Rd., Brighton, $33,130; concrete pipe sewerage lines in La Grange St., West Roxbury, to Charles Struzziery Co., 115 Kittredge St., Roslindale, $76,163. P.W.A. project. Bids July 10, awarded July 27. Noted July 12.

Mo., St. Louis—Bd. P. Wks., City Hall, 2,700 ft. 36 and 48 in. brick masonry or concrete sewers in tunnel Sect. C2, Downtown Relief Sewer System to R. C. Micotto Constr. Co., 6226 Itaska St., St. Louis, $81,477. P.W.A. Bids July 24. Noted July 5.

N. J., Woodbridge — Rahway Valley Joint Meeting, general contract sewage disposal plant to E. H. Latham & Co., 110 East Peddie St., Newark, $321,253***superstructure to Slonk Constr. Co., 810 Canton St., Elizabeth, $13,685***steel and iron to Globe Iron Wks., 168 West 24th St., Bayonne, $1,082***plumbing and heating to N. F. Cantello, 23 Christine St., Elizabeth, $1,403 and $2,150 respectively***electrical work to F. Bararacco Bros. & Co., 403 Washington St., Hoboken, $4,900***greenhouse

†*Federal Government.*

Sewerage, etc. (Continued)

and superstructure to American Moninger Green House Mfg. Co., 1947 Flushing Ave., Brooklyn, N. Y., $15,980***lift pumps to Worthington Pump & Mchy. Corp., 2 Park Ave., New York, N. Y., $17,800***screen chamber to F. H. McGraw Co., 51 East 42nd St., New York, N. Y., $10,000. Grand total $388,253. Bids June 22. Noted May 25.

N. Y., Albion—Dpt. Correction, State Office Bldg., sewer and waterlines at Albion State Training School to Barwess Constr. Co., 225 West 34th St., New York, $21,464. Bids June 16. Noted June 7.

Okla., Oklahoma City—City, sanitary sewers in Woodland Park addition, in Northeast 36th, Walnut, Sante Fe and Lincoln Sts., and in Putnam Heights addition, Northwest 37th, Sawyer and Sheperd Sts., by relief labor, $65,000 and $27,000 respectively. L. M. Bush, engr.

Okla., Oklahoma City—City, sanitary lateral sewers in Northeast 27th, Lindsay, McNabb, 28th and Grove Sts., by hand labor, $32,000. L. M. Bush, city engr.

O., Cincinnati—C. A. Dykstra, City Hall, constructing sanitary sewer in Bracker Rd., Raynes, between Baltimore Ave. and Felicity Dr., involving 9,300 ft. 30 to 78 in. rein.-con. and 275 ft. 24 in. vitr. clay pipe, to J. J. Welling, 2943 Lischer Ave., $113,282. **P.W.A.** Bids July 17.

O., Cincinnati — City Manager, constructing Muddy Creek outfall sewer, to Murdock Constr. Co., 4701 Main St., Norwood, $72,722. **P.W.A.**

R. I., Pawtucket—City Water & Power Dpt., City Hall, Brook St. trunk sewer extension, 2,600 ft. 36 in. concrete pipe sewer, to W. A. Gammino, Inc., 250 Hartford Ave., Providence, $23,240.

BRIDGES AND GRADE CROSSINGS

PROPOSED WORK

Conn., East Windsor—State, State Office Bldg., Hartford. J. A. Macdonald, comr., plans bridge and road. Est. $142,000. Federal allotment new P.W.A. program.

Massachusetts—Commonwealth of Massachusetts, Dpt. P. Wks., 100 Nashua St., Boston, F. E. Lyman, comr., A. W. Dean, ch. engr., rein.-con. and structural steel underpass Route 5, under New York, New Haven & Hartford R.R. tracks, and concrete paving 1.5 mi. hy. Holyoke.

Miss., Lucedale—George Co., defeated $37,000 for rein.-con. and steel bridge over Pascagoula River on Lucedale-Wiggins Rd.

N. Y., Batavia—New York Central R.R. Co., J. W. Pfau, ch. engr., 466 Lexington Ave., New York, plans eliminating main line grade crossings here. $4,000,000. Will submit plans to Pub. Service Comn.

North Carolina—State Hy. and P. Wks., Raleigh, bridge over Alamance Creek, Alamance Co., County Project 342. To exceed $20,000. J. D. Waldrop, Raleigh, engr.

O., Cleveland—State, O. W. Merrell, dir. hys., Columbus and Pennsylvania R.R., T. J. Skillman, Broad St. Sta., Phila., Pa., engr., plans concrete and steel grade crossing elimination, "Wards Crossing" on Northfield Rd. Est. $400,000. J. Jaster, Jr., Western Reserve Bldg., division engr. J. R. Burkey, Columbus, state engr.

R. I., Bridgeton—State Bd. P. Roads, State Office Bldg., Providence, plans rein.-con. and structural steel bridge over Pettaquamscott River. Awaiting approval of U. S. Army engrs.

Tenn., Nashville—City, plans viaduct. P.W.A. granted $193,000 loan. Freeland & Roberts, Independent Life Bldg., engrs.

Ont., London—City Council plans moving present steel bridge at York St. to Adelaide St. at Chelsea Green and rebuild it and replace York St. bridge with a wider steel bridge, est. $135,000. A Veitch, city engr.

BIDS ASKED

Calif., Los Angeles—Aug. 20, by Bd. Supervs., Los Angeles Co., rein.-con. and steel girder bridge over Los Angeles River, Barnham Blvd. Est. $58,000. W. D. Armstrong, 120 Hall of Records, engr.

Mass., Boston—Aug. 27, by C. J. Carven, comr. P. Wks., Room 508, City Hall Annex, repairing Northern Ave. bridge over Fort Point Channel. Noted May 10. Adv. E.N.-R. Aug. 9.

Mass., Waltham—Aug. 17, by purch. agt., City Hall, constructing steel and concrete bridge to replace present bridge over Charles River at Farwell St., incl. removal of present structure and middle pier, reconstruction of present abutments, construction of retaining walls for approaches, filling to grade of the approaches. P.W.A. project. F. L. MacDonald, M.D., mayor. Noted Oct. 19.

N. Y., Elmira — Aug. 12, by Pennsylvania R.R. Co., T. J. Skillman, ch. engr., Broad Street Sta., Phila., Pa., eliminating grade crossing here.

Ohio—See "Streets and Roads."

Ohio—Aug. 17, by O. W. Merrell, dir. hys., Columbus, timber bridge with steel stringers, capping present stone abutments with concrete, constructing timber bridge with steel beams, 47.2 ft. span, 24 ft. roadway, approaches to all bridges to be paved with traffic bound macadam, Sect. "B" Lancaster-Circleville Rd., Fairfield Co., est. $21,000; concrete beam bridge over Plum Creek and approaches, Sect. "Clarksburg" Chillicothe-Atlanta Rd., Ross Co., $6,190; steel truss bridge, 140 ft. span, over Mahoning River, 6 mi. west of Warren, known as the "Center of the World" Bridge, cold laid asphaltic concrete paving 0.129 mi. roadway on Sect. "A" Twinsburg-Warren Rd., Trumbull Co., $41,582.

Tex., Port Isabel—Aug. 16, by Padre Island Causeway Co., c/o J. W. Pate, McAllen, constructing pile trestle bridge across Laguna Madre from Port Isabel to Padre Island. Est. $400,000. P.W.A. project. V. L. Conrad, Woolworth Bldg., Brownsville, engr. Noted Aug. 2.

CONTRACTS AWARDED

Illinois—Dpt. P. Wks. and Bldgs., Div. Hys., Springfield, furnishing, delivering structural for bridge Section 571-SB-NRM-2 and Sect. 571-Dx SF-NRM-1, Niles Center, Cook Co. to American Bridge Co., 228 South LaSalle St., Chicago, $28,024 and $31,826 respectively***installing and erecting steel for foregoing bridges to W. J. Howard Inc., 10 South LaSalle St., Chicago, $8,207 and $12,756 respectively***rein.-con. substructures for Sect. 571-SB-NRM-1 same bridges to Keystone Builders, Inc., 9512 Charles St., $28,467***Sect. 571-SB-NRM-2 to M. J. McDermott & Co., 53 West Jackson Blvd., $79,670. Grand total $188,950. **P.W.A.** Bids June 19. Awarded July 8. Noted June 14.

Indiana—State Hy. Dpt., Jefferson City, bridge NRHM-156D, Jackson Co., to Steel & Uland, Bloomfield, $30,089***bridge in Dearborn Co., to H. Hicks & Son, North Vernon, $6,468. **P.W.A.** Bids July 10. Noted June 28.

Indiana—State Hy. Dpt., Jefferson City, bridge in White and Carroll Counties to W. C. Babcock Grain Co., Rensselaer, $91,886. **P.W.A.** Bids July 10. Noted June 28.

Maryland—State Roads Comn., Baltimore, double span rigid frame concrete bridge, approaches, etc., over Big Pipe Creek at Union Mills, Contr. C1-140-1-511, Carroll Co., to Thomas, Bennett & Hunter, Westminster, $27,722***triple span, steel girder bridge, encased in concrete, with concrete flooring, etc., over Baltimore & Ohio R.R., East-West Hy., Silver Springs, Contr. M-271-3-38, Montgomery Co., to Forbes-Murphy Contg. Co., 326 St. Paul St., $28,093. **P.W.A.** Bids July 31. Noted July 26.

†Mass., Bourne—U. S. Engr., Custom House, Boston, underpass over Cape Cod Canal to F. T. Westcott, North Attleboro, Mass., $88,800. Bids July 17. Awarded July 26. Noted July 12.

Missouri — State Hy. Dpt., Jefferson City, bridge in Carroll Co. to T. W. Spengler Constr. Co., Marshall***in Cole Co. to Drexel Constr. Co., 2004 Grand St., Kansas City***over Fenton Creek, St. Louis Co., over Terre Bleue Creek, St. Francois and over Saw Mill Creek, Ste. Genevieve Co., to T. F. O'Dell, Hannibal***over Crawford Branch, over Broomer Branch, over Hiawasse Creek, Benton Co. to Neyer Constr. Co., Billings***over drain, Carroll Co.; over East Creek, over Pilot Grove Creek, over Pilot Grove Creek, all foregoing Daviess Co., to A. Melberg, Cedar Rapids, Ia.***over Grand Ave. Creek, over proposed Kimsey Creek, over Squaw Creek Drain, over ditch, over old channel Little Tarkio Creek, over Holly Creek, all foregoing Holt Co. to G. Knutson, 3520 Main St., Kansas City***over Missouri Pacific R.R. and over Johnson's Creek, both Wayne Co. to List & Clark Constr. Co., Kansas City***over large draw and over Greasy Creek, Dallas Co. to Carte Harlan Constr. Co., West Plains. Bids July 20.

New Hampshire—State Hy. Dpt., Concord, 114 ft. through plate girder bridge, Rumney, Grafton Co., over Baker River, to O. W. Miller Co., Inc., Springfield, Mass., $26,359, est. $30,000. Bids July 26.

N. J., Newark—Dpt. P. Affairs, City Hall, renewing timber substructure and repairing steel work to Linde-Griffith Constr. Co., 152 Passaic St., Newark, est. $55,000. J. W. Costello, city engr.

N. Y., Albany—New York Central R.R. Co., J. W. Pfau, ch. engr., 466 Lexington Ave., New York, eliminating grade crossing at Central Ave., to W. M. Ballard, City Bank Bldg., Syracuse, General contractor let 1,100 tons structural steel to McClintic-Marshall Corp., Bethlehem, Pa. Noted June 7.

Ont., London—C. Talbot, engr., Middlesex County, County Bldgs., concrete abutments for new bridge over Thames River at Fanshawe, to Waltham & Fuller, Strathroy, steel for same, to London Structural Steel Co., Burslem St. Est. $26,000. Noted July 5.

STREETS AND ROADS

BIDS ASKED

California—State Hy. Comn., Sacramento, rejected bids grading, bituminous treated crushed gravel or stone surfacing 1.5 mi. hy. between South city limits and Wabash Ave. in city of Eureka, Humboldt Co. Noted June 21.

Connecticut—Aug. 13, by J. A. Macdonald, state hy. engr., Hartford, drainage improvement on U. S. Route 3, near Fort Hill, Groton, turfing 5,200 sq.yd. slopes on Warren Rd. Route 45, opposite Lake Waramaug, Washington; concrete flares at intersection of Highland Ave. and Route 11, Waterbury. 50 ft. skew span concrete T-beam bridge and 1,450 ft. waterbound macadam approaches, over Still River, Route 20, Winchester, foregoing Trunk Line Projects; twin 24 ft. span concrete slab bridge over Weekeepeemee River and waterbound macadam approaches, Woodbury, state project; rolled bank run gravel paving 12,305 ft., 4 section road, Ashford; 7,050 rolled bank run gravel on Birch Mountain Rd., Bolton; 7,975 ft. hy. on Iron Works Hill, South, and Stony Hill Rds., Brookfield; 5,820 ft. Pond Rd., and loose gravel paving 2,940 ft. Pine Hill Rd., Franklin; rolled bank run gravel surfacing 7,649 ft. Line Store and Chestnut Hill Rds., Killingly; bituminous macadam on broken stone base paving 2,185 ft. Railroad and East Aves., New Canaan; water-bound macadam paving 1,630 ft. Elm St., and rolled bank run gravel paving 8,657 ft. River Rd., Simsbury; loose gravel surfacing 14,555 ft. Carrion and Kenney Hollow Rds., Southbury; screened gravel on rolled bank run gravel base surfacing 8,782 ft. Lyons Plains Rd., Weston; substructure, concrete floor and grading for railroad embankment for relocation of Stafford Springs Underpass, Route 20, Stafford, this project is advertised for Central Vermont R.R., who will execute contract and under whose supervision work will be done; trap rock waterbound macadam paving 2,904 ft. Peck Rd., Bethany; 20 ft. span, concrete slab bridge and loose gravel approaches on Nonewaug Rd., and loose gravel surfacing 4,800 ft. Wood Creek Rd., Bethlehem.

Ind., Elkhart—Aug. 18, by Bd. P. Wks., W. P. Kraus, sheet asphalt or asphaltic concrete paving Strong Ave.

Kentucky—Aug. 17, by State Hy. Comn., Frankfort, various type surfacing 0.433 mi. street in Taylorsville, Rec. 18 A.S. Spencer Co.; applying bituminous surface treatment materials 12.761 mi. Winchester-Stanton Rd., M.P. R-A; 6.327 mi. Winchester-Paris Rd., M.P. 50-C, both Clark Co.; 5.384 mi. Georgetown-Williamstown Rd., M.P. 5-F, Scott Co.; 4.166 mi. Danville-Stanford Rd., M.P. 22-E, 4.806 mi. Danville-Lancaster Rd., M.P. 90-A, both Boyle Co.; 4.8 mi. Lexington-Harrodsburg Rd., M.P. 47-G, Fayette Co.; 5.404 mi. Nicholasville-Lexington Rd., M.P. 23-B, Jessamine Co.

Ky., Louisville—Aug. 15, by Dpt. Wks., constructing Jefferson St. between 15th and 18th Sts. Est. $30,000.

†Me., Augusta—Vet. Bu., Arlington Bldg., Wash., D. C., rejected bids June 28, resurfacing roads at Veterans Hospital. Noted June 14.

Maryland—Aug. 14, by State Roads Comn., Baltimore, stabilized earth, calcium, chloride treatment on 1.06 mi. road from Sykesville towards Marriottsville, Contr. C1-150-1-52, Federal Aid Project N.R.S. 292, Carroll Co.

Md., Baltimore—Aug. 15, by Bureau Hys., Municipal Bldg., sheet asphalt paving 13,775 ft. streets, Paving Contr. 647.

Massachusetts—Aug. 14, by Commonwealth of Massachusetts, Dpt. P. Wks., F. E. Lyman, comr., 100 Nashua St., Boston, bituminous macadam resurfacing and widening 18,775 ft. P.W.A. Project R-22, Docket 5450, Blandford and Russell. Est. $127,000.

N. Y., New York—Aug. 13, by S. Levy, pres. Manhattan Boro. Municipal Bldg., grading, sheet asphalt on concrete paving East 99th, Broome, West 40th, West 144th, West 130th and West 50th Sts.

N. Y., New York—Aug. 15, by S. Levy, pres. Manhattan Boro. Municipal Bldg., grading, asphaltic block paving 92nd, East 84th, Clinton and West 68th Sts.

N. Y., Port Chester—Aug. 13, by Village, Village Hall, improving Westchester Ave. and North Regent St. $61,700.

Ohio—Aug. 17, by O. W. Merrell, dir. Hys., Columbus, grading, draining, brick on concrete base widening 0.529 mi. Sect. "C" Toledo-Ann Arbor Rd., Lucas Co., $31,260; waterbound macadam and bituminous surface course paving 0.2066 mi. Sect. "C" Newark-New Lexington Rd., Perry Co., est. $5,573.

Ohio—Aug. 17, by O. W. Merrell, dir. hys., Columbus, brick paving incl. furnishing and delivering brick, and constructing concrete bridge with steel beams over Clear Fork of Mohican River and paving approaches on 0.281 mi. Sect. "B" Columbus-Wooster Rd., Ashland Co., $40,883; concrete and rein.-con. paving and constructing concrete beam bridge 0.775 mi. Sect. "I" National Rd., Muskingum Co., $94,107; waterbound macadam widening present base, replacing railing, constructing all and cold mixed asphaltic concrete surfacing 0.0005 mi. Sect. "C" Marysville-Kenton Rd., Hardin Co., $932; bituminous surface course paving and constructing concrete beam bridge over Silver Creek on 0.211 mi. Sect. "D" Georgetown-Wilmington Rd., Clinton Co., $9,033; grading, and salvaged brick on concrete base paving 0.165 mi. sections of drives on O.S.U. Campus, Franklin Co., est. $16,760; concrete paving 0.435 mi. Sect. "O" and "P" (part) Oberlin-Norwood Rd., Lorain Co., $19,554; 0.4361 mi. Sect. "A" Montpelier-North Rd., William Co., $16,123; grading, draining, waterbound macadam base widening and cold laid asphaltic concrete surfacing 2.665 mi. Sect. "C" Marysville-Kenton Rd., Hardin Co., $63,033; grading, draining,

Constr. News page 55

†Federal Government

Streets & Roads (Continued)

brick on concrete base widening 0.529 mi. Sect. "C" Toledo-Ann Arbor Rd., Lucas Co., $31,200; widening base and Westphalt or bituminous surface course widening 0.529 mi. Sect. "Wooster" Cleveland-Wooster Rd., Wayne Co., $12,738; salvaged brick paving 1.42 mi. Sect. "B" and "C" (part), Wooster-Dover Rd., Wayne Co., $77,580; cold mixed asphaltic concrete on waterbound macadam base paving 0.445 mi. Sect. "D" and "Bloomdale" (part), Baltimore-Fostoria Rd., Wood Co., $20,676; hot laid asphaltic concrete paving 2.691 mi. Sects. "A-2" and "B" (part) Wilmington-Hillsboro Rd., Clinton Co., est. $92,735.

Ohio—Aug. 18, by O. W. Merrill, dir. hys., Columbus, concrete paving 1.762 mi. Sect. "L-1" Salem-Unity Rd., Columbiana Co., est. $57,159; 4.017 mi. Sect. "I" Kalida-Lima Rd., Putnam Co., $133,928; concrete bridge with steel beams, having 60 ft. span, over Honey Run, and traffic bound surface course paving 0.102 mi. approaches on Sect. "B-1" Millersburg-Wooster Rd., Holmes Co., $11,126.

‡O., Cleveland—Aug. 17, by Treas. Dpt. at office Sup. Archt., Wash., D. C., remodeling driveway.

Okla., Oklahoma City — See "Contracts Awarded."

Pennsylvania—Aug. 17, at office S. S. Lewis, secy. Hys., Harrisburg, dual type paving consisting of 2 outer lanes of rein.-con., and center lane of bituminous surface, 12,834 ft. R-153, Sect. 10, Sellersville Boro, Hilltown and West Rockhill twps., involving 26,427 cu.yd. Class 1, 858 cu.yd. Class 2 and 3,153 cu.yd. borrow excav., Bucks Co.; rein.-con. widening 12,578 ft. R-281, Sect. 3, Morrisville Boro, Falls Twp., involving 19,877 cu.yd. Class 1, 785 cu.yd. Class 2 excav., Bucks Co.; bituminous surface course Spec. E on either native or modified broken stone base course paving 11,247 ft. R-854, Sect. R-2, Cambria and Munster Twps., involving 133,444 cu.yd. Class 1, 729 cu.yd. Class 2 and 876 cu.yd. borrow excav., Cambria Co.; rein.-con. paving 1,040 ft. R-163, Sect. 1, Lower Towamensing Twp., involving 21,532 cu.yd. Class 1, 110 cu.yd. Class 2 and 31 cu.yd. borrow excav., Carbon Co.; grading, rein.-con. paving 14,285 ft. R-29 and 307, Potter Twp., involving 41,158 cu.yd. Class 1, 309 cu.yd. Class 2 and 6,376 cu.yd. borrow excav., Centre Co.; 2 span through plate girder bridge, R-57, Rush and Decatur Twps., involving 4,336 cu.yd. Class 1, 654 cu.yd. Class 2 and 6,959 cu.yd. borrow excav., Centre and Clearfield Counties; rein.-con. paving 7,055 ft. hy. and rein.-con. bridge on R-92, Washington Twp., involving 7,058 cu.yd. Class 1, 458 cu.yd. Class 2 and 129 cu.yd. borrow excav., Clarion Co.; rein.-con. paving 4,497 ft. R25029, Mill Creek Twp., involving 672 cu.yd. Class 1, 541 cu.yd. Class 2 and 4,123 cu.yd. borrow excav., Erie Co.; rein.-con. paving, incl. 2 rein.-con. arches, and grading in connection with same, 13,473 ft. R-169, Sect. 5, Bear Creek and Buck Twps., involving 12,136 cu.yd. Class 1, 2,494 cu.yd. Class 2 and 1,644 cu.yd. borrow excav., Luzerne Co.; rein.-con. paving 22,771 ft. R-101, Sect. 1-A, Keating and Liberty Twps., involving 4,643 cu.yd. Class 1 excav., McKean Co.; rein.-con. paving 3,739 ft. hy. and constructing 2 rein.-con. bridges R-336, Zerbe Twp., involving 48,192 cu.yd. Class 1, 717 cu.yd. Class 2 and 17,011 cu.yd. borrow excav., Northumberland Co.; bituminous penetration surface course on native stone or modified broken stone base paving, 9,469 ft. hy. constructing rein.-con. bridge, grading in connection with same, R-236, Sect. 2, Eulalia and Hebron Twps., involving 11,177 cu.yd. Class 1, 335 cu.yd. Class 2 and 58 cu.yd. borrow excav., Potter Co.; double span I-beam stringer bridge, bituminous surface course, Spec. E on native stone base course paving hy. R-50, Bridge No. 12, Confluence Boro, involving 125 cu.yd. Class 1, 599 cu.yd. Class 2 and 890 cu.yd. borrow excav., Somerset Co.; rein.-con. pavement with relaid brick on reconstructed broken stone base 2.2 ft. wide on either side 1,957 ft. R-222, Windber and Paint Boro's Scalp Level Boro, involving 1,659 cu.yd. Class 1, 45 cu. yd. Class 2 and 280 cu.yd. borrow excav., Somerset and Cambria Counties; rein.-con. paving, etc., 7,018 ft. R-200, Sect. 1, Spring Creek Twp., involving 13,053 cu.yd. Class 1, 492 cu.yd. Class 2 and 119 cu.yd. borrow excav., Warren Co.

South Carolina—Aug. 14, by State Hy. Dpt., Columbia, asphalt on concrete paving, concrete widening 5.749 mi. U. S. Route 401, N.R.H. 359-B, Sect. 1, involving 47,428 cu.yd. common excav., etc., Sumter Co., engrs. est. $100,000; bituminous surfacing, widening sidewalk and curbing and guttering 0.513 mi. Route 76, N.R.M. 260-C and E, Sects. 1, 2 and 3, involving 1,286 cu.yd. common excav., etc., Florence Co., engrs. est. $141,000; 150 ft. rein.-con. bridge over White's Mill Pond, U. S. Route 401, N.R.H. 359-B, Sect. 1, involving 70 cu.yd. dry and 210 cu.yd. wet excav., etc., Sumter Co., engrs. est. $12,500; constructing new concrete piers and removing railroad embankments of underpass under C. and W. C. R.R., widening existing concrete bridge over Richland Creek, U. S. Route 276, N.R.M. 98-B, Sects. 1 and 2, involving 1,000 cu.yd. common excav., etc., Greenville Co., engrs. est. $13,500; furnishing f.o.b. Greenville, structural steel for foregoing bridge project N.R.M. 98-B, Greenville Co.

Tenn., Nashville—Aug. 14, by City, removing old wood block pavement and resurfacing with black base and asphaltic wearing surface on existing and new (if necessary), concrete foundation together with concrete gutters and necessary concrete curbing and sidewalks on Union, Commerce Sts., and 9th Ave. N., 6th Ave. N., and 2nd Ave. N.

Washington—Aug. 21, by L. V. Murrow, dir. state hys., Olympia, constructing bank protection along shore Nooksack River, on Rd. 1, Nuzent's Bridge Bank Protection, Project 7571, Whatcom Co.; constructing bank protection along shore South Fork Snoqualmie River State Rd. 2, Middle Crossing South Fork River, Project 8005, King Co.; and 2 treated pile and timber trestles with concrete decks, across Bone River and 712 ft. across Niawaukum River, Project 7763, Pacific Co.

Wisconsin—Aug. 21, by State Hy. and Douglas Co. Hy. Comms., Superior, grading, draining 12.116 mi. Bardon Avenue Rd., County Trunk Hy. C and A, P.W.C. 988, Sect. 1, incl. 64,154 cu.yd. earth, borrow, marsh, channel excav., 145 cu.yd. loose and 136 cu.yd. solid rock; 3.995 mi. County Trunk Hy. F, P.W.C. 988, Sect. 8, incl. 35,836 cu.yd. earth, borrow, marsh, channel, excav., 60 cu.yd. loose rock; grading, draining 6.933 mi. County Trunk Hy. K, P.W.C. 988, Sect. 12, incl. 29,756 cu.yd. earth, borrow, marsh, channel; 100 cu.yd. loose rock excav.; 14.891 mi. Coolidge Memorial Hy., P.W.C. 968, Sect. 18, incl. 90,797 cu.yd. earth, borrow, marsh, channel, excav., 325 cu.yd. loose rock excav.; constructing Nebagamon Creek Bridge, Coolidge Memorial Hy., P.W.C. 988, Sect. 27, incl. 150 cu.yd. excav., E. E. Parker, state hy. engr.

Wyoming — Aug. 17, by State Hy. Comm., Cheyenne, improving 18.337 mi. Cheyenne-Torrington Rd., Laramie and Goshen Counties, inc. 20,700 cu.yd. unclass. excav.; 21.579 mi. Sheridan-Gillette Rd., Sheridan and Campbell Counties; 3.466 mi. Moorcroft-Upton Rd., Weston Co. incl. 22,300 cu.yd. unclass. excav.; 15.982 mi. Moorcroft Streets and Moorcroft-Upton Rds., Creek and Weston Counties; 16.106 mi. in Eden Valley Rd., Sweetwater Co.; 18.357 mi. Lusk-Newcastle Rd., Niobrara Co.; 5.99 mi. Carlile-Hulett Rd., Crook Co.; 2.477 mi. Green River-Linwood Rd., Sweetwater Co.; 0.965 mi. Kemmerer Streets and 6 mi. Kemmerer-Big Piney Rd., Lincoln Co.; 17.66 mi. Buffalo-Sheridan Rd., Johnson Co.; 0.279 mi. Laramie St., Albany Co.; 5.992 mi. Sheridan-Ucross Rd., Sheridan Co.; bridge over Little Red Creek, Fremont Co.

CONTRACTS AWARDED

‡Arizona — Bu. P. Rds., Phoenix, grading, draining 3.537 mi. Kingman-Boulder Dam Highway, Mohave Co. to All Arizona Eng. & Constr. Co., Clifton, $51,175. **P.W.A.** Bids July 19.

Georgia — State Hy. Bd., Atlanta, paving 3.555 mi. Dahlonega-Dawsonville Rd., Dawson Co., to S. E. Finley, North Ave., Atlanta, $40,573; 6.742 mi. Dublin-Swainsboro Rd., Emanuel and Johnson Counties, to Claussen-Lawrence Constr. Co., 1114 Telfair St., Augusta, $131,957. Bids July 12. Noted July 5.

Ill., Chicago—Dpt. P. Wks. and Bldgs., to Stanley Jaicks Co., Winfield, concrete paving 0.5034 mi. road in River Forest, $41,888; 1.7566 mi. near Chicago, $57,454; 0.4149 mi. near Hillside $18,509***to Arcole Constr. Co., Niles Center, 0.9945 mi. near Chicago, $86,389; 0.9952 mi. near Cicero $77,531. Grand total $282,221. Bids June 5.

Ill., Danville—Dpt. P. Wks. and Bldgs., Div. Hys., concrete paving 1.2381 mi. Sect. 24-MFT, Vermilion Co., to L. B. Dyer Constr. Co., Hoopeston, $27,463. Bids July 9. Noted July 5.

Ill., Springfield—Dpt. P. Wks. and Bldgs., Div. Hys., brick paving 0.2924 mi. Sect. 130-S-MFT, Sangamon Co., to J. L. Simons Co., Springfield, $128,000. Bids June 20.

Indiana—State Hy. Comm., Indianapolis, improving 0.721 mi. road in Allen Co. to Grace Constr. & Supply Co., Fort Wayne, $26,135. **P.W.A.** Bids June 12. Noted July 19.

Indiana—State Hy. Comm., Indianapolis, improving 1.961 mi. road in Carroll Co. to R. Daoust, Defiance, O., $65,746. **P.W.A.** Bids July 10. Noted July 5.

Indiana — State Hy. Comm., Indianapolis, liquid asphalt paving 7.59 mi. and 7.62 mi. road in DeKalb Co., to Rosenberry & Gunsoullus, Butler, $16,945 and $17,103 respectively; est. $23,133 and $23,683 respectively***6.804 mi. in Clark and Scott Counties, to Dryden & Wilkinson, Wirt, $44,909. Grand total $78,867. Bids July 17.

Indiana—State Hy. Comm., Indianapolis, improving 18.25 mi. road in Adams and Allen Counties, to Tri-Lake Constr. Co., Columbia City, $21,576, est. $23,115***8.4 mi. in Blackford Co., to D. Jenkins, Terre Haute, $19,878, est. $24,349***10.6 mi. in Jennings Co., to C. W. Bridges, Coatesville, $12,761, est. $13,160***9.97 mi. road in Tippecanoe Co., to S. S. Palma, Lafayette, $4,756, est. $5,751***10.99 mi. road in Benton Co., to W. Mahoney, Lafayette, $71,584, est. $74,977. Grand total $310,495. **P.W.A.** Bids July 10. Noted July 5.

Iowa—State Hy. Comm., Ames, surfacing 3.3 mi. in Adams Co. to Wohl Constr. Co., Victor, $4,847***3.2 mi. Fremont and 7.9 mi. Taylor Co. to Kelley Constr. Co., Des Moines, $707 and $2,812 respectively. Grand total $8,367. Bids rejected July 31, roads in Harrison and Shelby counties. Bids July 31. Noted July 26.

Ia., Ida Grove—Ida Co., grading 15.92 mi. on County trunk road, incl. 238,000 cu.yd. excav., to E. M. Duesenberg, Mason City, $41,650.

Maryland—State Roads Comm., Balt... dual hy., concrete surfacing 3.11 mi. ... A-132-1-78, Federal Aid Project N.R.H. ... Anne Arundel Co., to Christhilf & Ensey ... Ridgely St., Baltimore, $202,172. ... project. Bids June 26. Noted June 21.

Maryland—State Roads Comm., Bal... concrete paving 1.91 mi. Contr. S-74 ... Federal Aid Project N.R.S. 337, Somerset ... to Waller & Phillips, Salisbury, $5... **P.W.A.** Bids June 5.

Maryland—State Roads Comm., Bal... concrete paving 2.23 mi. Contr. Co-94-1-22 ... eral Aid Project N.R.S. 336, Caroline ... Waller & Phillips, Salisbury, $51,719. ... Bids June 19. Noted June 14.

Mississippi — E. D. Kenna, dir., State H... Comm., Jackson, grading, drainage, struc... bridging 9.174 mi. Hazelhurst-Jackson ... Copiah Co., to C. Weaver, Anoka, Minn., ... 583, est. $144,000***4.465 mi. Morton-... Hy., Scott Co., to T. L. James, Ruston, ... $42,680, est. $46,000***grading, drainage ... tures, bridging, gravel surfacing 2.234 ... Eupora-Mathiston Hy., Webster Co., to H... Clarke Constr. Co., Peoria, Ill., $52,872 ... $62,000. Grand total $214,135. Bids July 31.

Missouri—State Hy. Dpt., Jefferson City: A. Melberg, Cedar Rapids, Ia., grading ... mi. Carroll Co. $13,659; 2.625 mi. Daviess ... $17,378; 2.956 mi. Cole Co., $10,059***... Knutson, 3520 Main St., Kansas City, ... mi. Rulo-Forest City, Sect. 2 $6,053; 4.165 mi. ... Sect. 4 $24,135; 4.564 mi. Sect. 3 same ... $8,281, all foregoing Holt Co.***to M. H. ... St. Joseph, 3.163 mi. Buchanan Co. $8,21...*** ... to L. W. Spengler Constr. Co., Marshall, 1.966 ... mi. Carroll Co. $11,818***to F. T. ... Hannibal, 3.348 mi. St. Francois Co. $10,101; ... 1.136 mi. Ralls Co. $3,175; 4.914 mi. ... Genevieve Co. $21,117; graveling 0.804 mi. ... Louis Co. $10,926***to J. Pohl, Nevada, 2.877 ... mi. Sect. 2A, Lowry City-Iconium Rd., 2.... 2.841 mi. same road $1,493, both St. Clair ... 4.204 mi. Boone Co. $8,088***to List & ... Constr. Co., Kansas City, graveling 0.98 ... Piedmont Rd., Northwest, 37.851; 0.12 ... same road 0.12 mi. $539***to H. Tidd, Brookfield, 1.008 mi. Linn Co. $2,717***to Skramka Constr. Co., Security Bldg., St. Louis, 3.39 mi. ... Pemiscot Co. $4,228***to Porter DeWitt Const. Co., Kirkwood, 0.726 mi. St. Louis Co. $87,100 ***to Davis Constr. Co., Boonville, 0.795 mi. in St. Charles Co., $25,188***to W. H. Johnson & Sons, Des Arc, 2.529 mi. St. Francois Co. $2,834***to Carte Waters Corp., Kansas City, 3.795 mi. Meadville Rd., North Sect. 1A, $3,754; 3.905 mi. same road Sect. 3A, all foregoing Linn Co. $2,591***to M. E. Gillioz, Monett, bituminous surfacing 2.006 mi. Springfield-South Rd., $6,899; 3.25 mi. Sect. 2A, $11,033, both Greene Co.***to Neyer Constr. Co., Billings, 4.139 mi. Route 54-Bronaugh Rd., Sect. 2A, $5,609; 4.658 mi. Sect. 3A, both Vernon Co.; 4.825 mi. in Benton Co. $20,353; 3.33 mi. road in Lawrence Co. $11,163***to C. Spitcaleky, Kansas City, crushed stone surfacing 4.545 mi. Harrisonville Rd., East, Sect. 1A $2,200; 4.545 mi. same road Sect. 2A $1,861; 4.112 mi. same road Sect. 3A $1,146; 1.875 mi. East Lynne Route C Rd., $700; 2.606 mi. Grain City-Route C Rd., $602, all foregoing Cass Co. ***to Asphalt Paving Co., 1328 Sublette Ave., St. Louis, 4.873 mi. Route 54-Tuscumbria Rd. Sect. 3B, $17,707; 4.779 mi. Sect. 5C same road $17,489; 0.567 mi. Thru Tuscumbria Rd. Sect. 49A, $3,232. All foregoing Miller Co.*** to W. A. Ross Constr. Co., 25th and Summit Sts., Kansas City, 1.362 mi. Kansas City East Sect. 352A1, $63,310; 0.035 mi. same road Sect. 352A2, $470. Grand total $447,455. Bids July 20.

Nevada—State Hy. Comm., Carson City, grading, draining, graveling 6.12 mi. road in Clark Co. to Dodge Constr. Co., Fallon, $73,729. **P.W.A.** Bids July 30. Noted July 26.

New Hampshire—State Hy. Dpt., Concord, 6 in. one course rein.-con. on gravel base course paving 25,048 sq.yd. Daniel Webster Hy., Merrimack, Hillsboro Co., to E. Perini & Sons, Inc., Framingham, Mass., $68,246, est. $70,000. Bids July 19.

N. J., Vineland—Landis Twp., excavating, graveling, oiling, c.i. pipe in Oxford St. and E. R.R. Blvd., to Allen Eng. & Contg. Co., Newark, $24,931. Bids July 30.

N. J., Vineland — Town, grading, curbing, graveling, bituminous surfacing 2nd, 3rd, 4th, 8th, Plum, Almond, Grape and Quince Sts., to Burkett Constr. Co., Landis Ave., Vineland, $89,908.

N. Y., West Haverstraw—Commissioner Dpt. Mental Hygiene, State Office Bldg., Albany, constructing roads and walks at New York Reconstruction Home, to I. Bedford, Thiells, $32,217. Bids July 17. Noted June 28.

O., Cincinnati—Dir. P. Wks., 3 in. sheet asphalt topping, 6,600 sq.yd. and concrete paving 3,725 sq.yd. south one half of Mitchell Ave., to Byrnes-Conway Co., 19 Bank St., St. Bernard, $49,686, est. $56,678. Bids July 10.

Okla., Oklahoma City—City, grading, paving 3 blocks Stiles Ave., by relief labor, $27,000. L. M. Bush, city engr.

R. I., Providence—City, Hy. Dpt., S. F. Nolan, comr. P. Wks., bituminous macadam paving 2 mi. Wayland Ave., Aborn, Brook, Charles and Governor Sts., to M. A. Gammino Constr. Co., 728 Valley St., $74,368. Awarded July 26.

†*Federal Government.*

Constr. News page 56

Streets and Roads (Continued)

Wash., Seattle—Bd. P. Wks., timber, piles for use on Railroad Ave. to A. Cugini, Renton, $14,678. Bids July 25.

Wisconsin—State Hy. and Polk Co. Hy. Comms., Superior, grading, draining 9.052 mi. St. Croix Falls-Milltown Rd., State Trunk Hy. 35, to J. R. McLean, Superior, $33,834. Bids July 24. Noted July 19.

New Brunswick—Minister of Hys. of Provincial Govt., Fredericton, to Rayner Constr Co. Ltd., 29 Commercial St., Toronto, Ont., constructing 11 mi. hy. from Woodstock to Hartland Bridge, $146,852, constructing 8.1 mi. from Sunet to Penobsquis Bridge, $111,400; constructing 10 mi. between Moncton West and Moncton South, $169,993, constructing 8.04 mi. from St. Stephen to Gitman Corner, $143,055***to Currie and Seymour Ltd., Fredericton, constructing 7.05 mi. from Fredericton to McKinley Ferry, $122,650***to Dufferin Paving Co. Ltd., Montreal, Que., constructing 12.03 mi. from Fairville to Westfield Corner, $217,680***to Diamond Constr. Co. Ltd., Fredericton, constructing 8.08 mi. from Campbellton to Dalherive, $131,410. Grand total $1,043,040.

Ont., Fort William—Town, asphaltic concrete on 4 in. black base paving 19,500 sq.yd. International Hy. within city limits, to Warren Bituminous Paving Co. Ltd., 74 University St., Toronto, $45,825.

Ont., London—C. Talbot, engr., Suburban Roads Comn., County Bldgs., concrete paving 24 mi. Hamilton Rd. E., to Towland Constr. Co., Guelph, $40,000.

Ont., Toronto—City, asphaltic paving Spadina Rd., Contr. A, to Godson Contg. Co. Ltd., 203 Richmond St. W., $8,590***Spadina Rd., Contr. B, to Kilmer, Gibson and Van Nostrand, 375 Fleet St. W., Toronto, $10,737***Spadina Rd., Contr. C, to Standard Paving Co. Ltd., Harbor Comn. Bldg., $10,211***St. Clair Ave. W. and concrete curbing, N.S. St. Clair W., to Grant Contg. Co. Ltd., 47 Wellington St. E., $9,529 and $2,579 respectively***concrete sidewalks Creng Ave. and Wembley Dr., to Pace & Co., 317 Manning Ave., $752. Grand total $42,398.

EARTHWORK, IRRIGATION DRAINAGE AND WATERWAYS

PROPOSED WORK

Calif., Alturas—Big Valley Irrigation Dist. plans irrigation storage reservoir on Pitt River, Modoc Co. Est. $250,000. P.W.A. allotted $160,000 loan and grant. S. A. Marsher, Alturas, engr. Noted Aug. 2.

Calif., Santa Barbara—City plans beach protection groynes, to involve 580 tons steel sheet piling 80 wooden piles, 20 ft., 1,600 ft. timber, bumper caps. P.W.A. allotted $46,000 loan and grant.

†Illinois—U. S. Eng., Post Office, Chicago, bids soon, dredging 800,000 cu.yd. common earth from Lower Illinois River from Mile 11.2 near Hardin to Mile 229.3 near Starved Rock. (**Correction—yardage**). Noted July 26.

†Mich., Whitehall—U. S. Eng., Milwaukee, Wis., preliminary plans harbor improvements incl. piers and revetments, at White Lake, entrance harbor.

Tex., Donna—Donna Irrigation Dist. Hidalgo Co., c/o A. W. Weinert, Donna, plans concrete lining 32 mi. main canals and 70 mi. laterals, Units 2, 3 and 4. Bids will not be called for this work until award is made for unit 1. Est. $720,000. A. Tamm, Harlingen, engr. P.W.A. project.

Tex., Donna—Donna Irrigation Dist., Hidalgo Co. No. 1, c/o A. W. Weinert, pres., Donna, takes bids about Aug. 21, lining all 8 mi. lateral canals, north of 2nd lift pump, with concrete, Unit 1. Est. $500,000. Total est. $1,220,000. P.W.A. project. A. Tamm, Harlingen, engr.

Tex., Mission—Hidalgo Co. Water Control & Imprv. Dist. 6, c/o E. M. Card, Mission, plans irrigation work, placing canal lining and laying concrete pipe. $399,000. P.W.A. allotment approved. E. M. Card, Mission, engr. Noted July 27, 1933.

BIDS ASKED

†Ga., Augusta—Aug. 31, by U. S. Eng., Savannah, constructing lock and dam in Savannah River, below here.

†Maine—Aug. 20, by U. S. Eng., Customhouse, Boston, Mass., repairing breakwater at Matinicus Island.

†Mississippi and Louisiana—Aug. 23, by U. S. Eng., P. O. Box 667, Vicksburg, Miss., constructing 1,708,300 cu.yd. earthwork in east bank Mississippi River, in Mississippi, and 556,000 cu.yd. earth embankment on west bank in Louisiana.

†New Jersey—Aug. 20, by U. S. Eng., 1109 Gimbel Bldg., Phila., Pa., dredging 1,592,000 cu.yd. in Delaware River between Burlington and Florence; and 7,200 cu.yd. near Felanco.

†Wyoming—Aug. 27, by Bu. Reclamation, Dpt. Interior, Casper, constructing earthwork, tunnels, structures for Casper Canal, Casper Alcova Project, incl. 3,332,000 cu.yd. open cut excav., 27,000 cu.yd. tunnel, excav., etc.

CONTRACTS AWARDED

†Alabama—U. S. Eng., Mobile, dredging 2,750,000 cu.yd. from Mobile Bay Channel, to Standard Dredging Co., 80 Broad St., New York, N. Y., $93,225. Bids July 18.

†Montana — Frazier-Davis Constr. Co., 1319 Macklind Ave., and G. L. Tarlton Co., Ambassador Bldg., both St. Louis, general contractors, 15,000 tons sheet steel piling to Illinois Steel Co., 506 Olive St., St. Louis, Mo., and to Jones & Laughlin Steel Corp., Boatmen's Bank Bldg., St. Louis, for U. S. Eng., Kansas City, Mo. Bids July 9. Noted June 21.

†Montana—Bu. Reclamation, Dpt. Interior, Fairfield, excavation and enlarging laterals on Mill Coulee Canal, Greenfield Div., to Lease & Leingland, Great Falls, $36,861. **P.W.A.** Bids July 12. Noted June 28.

†New Jersey—U. S. Eng., 2nd Dist., 39 Whitehall St., New York, dredging Sect. A and B, Newark Bay and Hackensack River, to Morris & Cummings Dredging Co., Inc., 44 Whitehall St., New York, $125,132***dredging Sect. C, to Arundel Corp., Pratt St., Baltimore, Md., $32,143. Bids June 25. Noted June 21.

†Oregon—Bureau Reclamation, Portland, constructing concrete powerhouse substructure, incl. excav., removing cofferdam at Bonneville Dam, to General Constr. Co. and J. F. Shea Co., Inc., Henry Bldg., Portland, $3,895,592. Bids July 5. Noted July 12.

Ont., Oshawa—N. Desjardins, secy. Dpt. P. Wks., Ottawa, harbor addition and dredging, to R. C. Huffman Constr. Co., Ltd., 331 Bay St., Toronto, $76,249 est. $100,000. Bids July 18.

Que., Baie des Sables — Secretary Dpt. P. Wks., Ottawa, Ont., new 225 ft. long x 221 ft. x 30 ft. wide cribwork wharf extension, to Dumont & Damous, Riviere du Loup, $15,562 est. $14,000. Bids July 12.

Que., Rimouski — Secretary Dpt. P. Wks., Ottawa, wharf extension to La Cie Suettere Ltee, Rimouski, $14,617. Est. $20,000. Bids July 6. Noted June 28.

UNCLASSIFIED

PROPOSED WORK

Colo., Colorado Springs — POWER TRANSMISSION LINES—Municipal Electric System, c/o E. Mosley, city mgr., plans power transmission line from Colorado Springs, through North Cheyenne or Bear Creek Canons to Bruin Inn.

Kan., Emporia—GAS DISTRIBUTION SYSTEM—City plans application to P.W.A. for $300,000 grant to finance construction of gas distribution system. Est. $1,000,000. Black & Veatch, 700 Mutual Bldg., Kansas City, Mo., engrs.

†Me., Thomaston—BEACON—Superintendent Lighthouses, 1st Dist., 156 Federal St., Portland, Me., rejected bids rebuilding St. Georges Beacon in St. George River. Will readvertise. Noted June 28 under "Contracts Awarded."

Mass., Boston—CABLES—City, Police Dpt., E. C. Hultman, comr., 60 Bristol St., plans installing cables. P.W.A. project. Est. $35,000. Jackson & Moreland, 31 St. James Ave., Boston, engrs.

Mich., Unionville — COAL MINE STRUCTURES—Robert Gage Coal Co., Unionville, plans coal mine structures, incl. installation of two 600 hp. vertical tube boilers with spray pond 100x800 ft., all steel head frame tipple and coal pocket, approximately 2 mi. of railroad spur track to mine. Private plans.

Nev., Virginia City — RAILROAD — Sutro Tunnel Coalition Co., Inc., Virginia, City plans rerouting tracks of Truckee and Virginia City Railroad to permit working ore deposits. $100,000.

N. H., Nashua—FIELD HOUSE, etc.—City, City Clerk, City Hall, plans application for Federal Aid to construct field house and grandstand. Est. $103,000.

N. Y., Brooklyn—SWIMMING POOL—Dpt. Parks, Arsenal Bldg., Central Park, New York, plans swimming pool, Hicks and Lorraine Sts. To exceed $40,000.

N. Y., Flushing—SWIMMING POOL—Dpt. Parks, Arsenal Bldg., Central Park, New York, plans swimming pool, Grand Central Parkway and Flushing Meadows. $40,000.

N. Y., New York—SWIMMING POOL—Dpt. Parks, Arsenal Bldg., Central Park, plans swimming pool, Riverside Dr. and 75th St. $40,000. Maturity later.

North Carolina—POWER TRANSMISSION LINES—State Bd. Rural Electrification, Dr. C. Poe, chn. Bd., plans erecting power transmission lines in 75 counties. D. S. Weaver, c/o N. C. State College, Raleigh, preparing to make survey for same.

Okla., Oklahoma City—GAS LINE—White Deer Pipe Line Co., 1142 Southeast 29th St., plans 9 mi. 14 in. gas line in gas field, here. $70,000. Private plans.

Okla., Oklahoma City—OIL LINE—Phillips Petroleum Co., Bartlesville, plans 12 mi. 8 in. natural gas line in city oil field. $60,000. A. H. Riney, city engr. Noted Aug. 3, 1933.

Pa., Phila.—ELEVATED RAILWAY EXTENSION—City Dpt., City Transit, City Hall Annex, plans extending Frankford Elevated Ry. from Bridge St. (present terminus) to Rhawn St. Est. $7,000,000. L.W.D. grant of $70,000 approved for preparation of plans. Noted Jan. 4.

B. C., Nelson—TRAMWAY—See "Industrial Work."

BIDS ASKED

†Md., Annapolis—RADIO TOWERS—Aug. 15, by Yards & Docks, Navy Dpt., Wash., D. C., altering steel radio towers at Naval Academy High Power Radio Station, Spec. 7733.

Mo., Kansas City—SWITCHING, TRACKS—See "Contracts Awarded."

Miss., Gulfport—PIER, etc.—Aug. 30, by J. R. Dent, pres. Gulfport Comn., 1 story, 122x1,760 ft. brick, steel, rein.-con. pier and warehouse, and auxiliary improvements on the west side of Gulfport Harbor, watersupply, electrical installation, hydraulic fill, ice making and cold storage office building, etc. Est. $1,150,000. Shourds & Bean, Gulfport, archts. and engrs. Noted June 28.

Mo., St. Louis — PARK — See "Contracts Awarded."

Tex., San Antonio—STADIUM—See "Contracts Awarded."

CONTRACTS AWARDED

Conn., Waterbury — GOLF COURSE — City, Park Dpt., completion of municipal golf course, to Landscape Engineering Co., Providence, R. I., $51,920. Awarded July 25. Noted July 19.

†Mass., Salem—GASOLINE FUELING SYSTEM—U. S. Coast Guard, gasoline fueling system at Winter Island Coast Guard Station to Aqua Systems, 2443 3rd Ave., New York, N. Y., $9,800.

Mo., Kansas City—SWITCHING, TRACKS, etc.—City, roadway, switching and tracks at State Line Wharf by day labor. $20,000. R. Waddell, city engr.

Mo., St. Louis—PARK—State, W. Buford, state Game and Fish Comr., improving 868 acre Babler Memorial Park on Wild Horse Creek and Missouri River, incl. 2 mi. telephone lines, 8 mi. fire breaks, reducing fire hazards for 400 acres, general cleanup for 100 acres, forest improvement 200 acres; thinning out trees, cutting brush, 2 mi. truck trails, 2 mi. horse trails, 2 mi. foot trails, clearing 50 acres for camp facilities; 5 mi. fence, 2,000 ft. well for water supply; 10,000 gal. water storage facilities; shelter and concession building, 2 combination lookout towers and shelter buildings, 5 cabins, tool and service building, caretakers cottage; 8 ft. bridges, 2 vehicular bridges, riprapping 3 mi. Wild Horse Creek, for swimming facilities and several small dams by Civilian Conservation Corps labor.

N. J., Greystone Park—STEAM LINES—Dpt. Institutions & Agencies, State Office Bldg., Trenton, underground steam lines in conduit at state hospital, to H. W. Porter, 825 Frelinghuysen Ave., $26,000***piping, to L. J. Plach, Inc., 24 Main St., West Orange, $6,226. Bids July 24.

N. J., Newark—SIGNAL EQUIPMENT—Dpt. P. Affairs, City Hall, furnishing and installing signal equipment for city railroad, to Union Switch & Signal Co., Swissville, Pa., $241,760.

†Pa., Middletown — GASOLINE FUELING LINE—Con. Q.M., gas fueling system, to Aqua Systems, 2443 3rd Ave., New York, $20,588. Bids July 23. Noted July 19.

Tex., San Antonio—STADIUM—San Antonio Sports Assn., c/o H. Winters, 2223 North St. Marys St., municipal athletic stadium, incl. baseball, football, tennis, track, showers, lockers, dressing rooms, 10,000 seating capacity grandstand, etc. Day labor under supervision Federal Relief. Est. $100,000. Phelps & DeWees, Gunter Bldg., and R. Ayres, Smith, Young Tower, archts. W. E. Simpson, Milam Bldg., and Lilly & Drought, Frost Bldg., engrs. Noted July 26.

Alta., Edmonton—RAILYWAY LINE—City of Edmonton Street Railway, A. W. Haddon, city engr., constructing new line on 118th Ave., to Crown Constr. Co., 11351 82nd St., $53,971.

MATERIALS AND EQUIPMENT

PROPOSED WORK

TANKS—St. Louis, Mo.—Wendel Shasserre, 5695 Wells Ave., applied for permit to install three 1,000 gal. tanks for gasoline at 6801 Watson Rd.

TANKS—Rochester, N. Y.—Colonial Beacon Oil Co., 40 Franklin St., plans 2 storage tanks and bulk plant. $30,000.

ELECTRICAL EQUIPMENT—Goudreau, Ont.—Kozak Mining Co., Goudreau, Sault St. Marie, N. Kozak, ch. engr., contemplates installation of electrical equipment for gold mining, approximately $30,000. Interested in prices and information.

Constr. News page 57

†Federal Government.

Material & Equip. (Continued)

BIDS ASKED

DISCONNECTING SWITCHES—**Los Angeles, Calif.**—Aug. 24 (extended date) by D. P. Nicklin, purch. agt., Dpt. Water & Power, 207 South Bway., furnishing sixteen 287,000 volt motor operated disconnecting switches, Spec. 1454. Noted July 19.

OIL CIRCUIT BREAKERS — **Los Angeles, Calif.**—Aug. 24, by D. P. Nicklin, purch. agent, Dpt. Water & Power, 207 South Bway., furnishing 15,000 V. 3-pole, single throw frame mounted outdoor type oil circuit breakers; (2) alternate same; (a) f.o.b. cars bidders shipping point, (b) f.o.b. cars trucks, Los Angeles, (c) f.o.b. cars bidders shipping point, freight allowed to Los Angeles, Spec. 1475. To exceed $2,000.

STREET SWEEPERS—**Hartford, Conn.**—Aug. 21, by Bd. Contr. & Supply, C. M. Yale, secy., furnishing 2 motor pick-up street sweepers; adv. E.N.-R. Aug. 9.

CRUSHED AGGREGATE, etc.—**Indiana**—Aug. 17, by State Hy. Comn., Indianapolis, 800-1,000 tons crushed aggregate, gravel or slag Rd. 14; 500 tons crushed aggregate near State Rd. 29; 1,000-2,000 tons gravel f.o.b. Noblesville; 200-400 tons crushed aggregate, gravel or slag; 500-800 tons crushed aggregate, gravel or slag State Rd. 3.

CONCRETE AGGREGATE, GRAVEL or SLAG—**Indiana**—Aug. 14, by State Hy. Comn., J. D. Adams, ch., Indianapolis, 500 tons crushed aggregate, gravel or slag; 500 tons crushed aggregate; 1,000-1,500 tons crushed aggregate; 1,000-1,500 tons crushed aggregate f.o.b. Oakland City; 700-1,000 tons crushed aggregate f.o.b. Shelburn; 2,200-2,900 tons crushed run stone; 400-600 tons limestone screenings, 400-600 tons crushed run stone.

TRUCKS—**Ames, Ia.**—Aug. 13, by State Hy. Comn., Ames, 13 heavy duty snow removal, 4 wheeler drive trucks. F. R. White, ch. engr.

†COPPER NICKEL ALLOY, etc. — **Boston, Mass.**—Aug. 14, by Bu. Supplies & Accounts, Navy Yard, furnishing copper nickel alloy and rivet steel to Boston Navy Yard.

CULVERT PIPE—**Cedar Rapids, Ia.**—Aug. 16, by Linn Co., R. M. Vesly, co. aud., 450 lin. ft. culvert pipe. W. H. Behrens, city engr.

†CABLE—**Brooklyn, N. Y.**—Aug. 20, by Signal Supply Officer, Army Base, 58th St. and 1st Ave., cable.

†ELECTRICAL SUPPLIES—**Huntington, W. Va.**—Aug. 13, by U. S. Eng., electrical supplies for U. S. Lock 3, Kanawha River.

†HEATING FURNACES, etc. — **Huntington, W. Va.**—Aug. 13, by U. S. Eng., heating furnaces for U. S. Lock 19 and 28, Ohio River.

†ASH HOIST—**Norfolk, Va.**—Aug. 28, by Treas. Dpt. at office Sup. Archt., Wash., D. C., ash hoist at U. S. Marine Hospital.

†REFRIGERATION EQUIPMENT—**Norfolk, Va.**—Aug. 15, by Yards & Docks, Navy Dpt., Wash., D. C., refrigerating equipment at Naval Operating Base, Spec. 7726.

ELECTRIC PUMP, etc.—**Sawyerville, Que.**—Municipal Clerk in market for supply of 1 hydraulic electric pump, designed to force water 1-100 ft. with elevation of 75 ft.

CONTRACTS AWARDED

STEEL PIPE—**Los Angeles, Calif.**—City, A. J. Holm, purch. agt., City Hall, furnishing 3,400 ft. double-dipped, lap-welded plain end steel pipe, delivered to Griffith Park, Informal Bid 922, to Crane Co., 321 East 32nd St., $1,241. Awarded July 25.

CONCRETE AGGREGATE—**Oakland, Calif.**—J. H. Kimball, secy., East Bay Municipal Utility Dist., 512 16th St., furnishing 2,700 tons fine concrete aggregate and 6,500 tons coarse concrete aggregate, to Hirt & Lloyd, Lafayette St., $4,725 and $11,375 respectively.

DITCHER—**Oakland, Calif.**—J. H. Kimball, secy., East Bay Municipal Utility Dist., 512 6th St., furnishing one Barber-Greene ditcher or equal with vertical boom mounted on crawler tread to handle excavating capacity of 18, 21 and 24 in. width of trench and 8 ft. 3 in. depth of trench, power to be supplied by 4-cylinder heavy duty engine at least 381 cu.in., in piston displacement with five speed, to Jenison Machinery Co., 900 Tennessee St., San Francisco, $5,669. Bids June 27. Noted June 14.

WATER PIPE FITTINGS—**Oakland, Calif.**—J. H. Kimball, secy., East Bay Municipal Utility Dist., 512 16th St., furnishing 1,350 c.i. bell and spigot waterpipe fittings, from 4 to 12 in., Spec. LS 121, c.i. tees and crosses and c.i. reducers and risers, to Grinnell Co. of the Pacific, 5th and Brannan Sts., San Francisco, $1,491 and $663 respectively•••c.i. elbows and c.i. sleeves, nipples and plugs, to Phoenix Iron Wks., 2nd and Castro Sts., $651 and $751 respectively. Bids June 4.

Constr. News page 58

CONDUIT—**Chicago, Ill.**—City, 22,000 ft. 3½ in. fiber conduit to Westinghouse Electric Supply Co., 113 North May St., $2,488. Bids July 18, awarded July 26. Noted July 12.

GRAVEL—**Indiana**—State Hy. Comn., Indianapolis, 3,000 tons gravel at Crawfordsville, to Davis & Richard, Wingate, $4,050. Bids July 16.

ROCK ASPHALT—**Indiana**—State Hy. Dpt., Indianapolis, 40 tons rock asphalt at Howell to Natural Rock Asphalt Co., Louisville, $384••• electrical equipment at Rockville to J. H. Drew, 316 Traction Bldg., Indianapolis, $352. Bids July 23. Noted July 19.

ROAD MAINTAINER—**Columbus City, Ind.**—Bd. Comrs. Whitley Co., road maintainer tractor, to J. D. Adams Co., 217 South Belmont St., Indianapolis, $2,396. Bids July 24.

ROAD OIL—**Dana, Ind.**—Bd. Comrs. Vermillion Co., road oil, to J. J. Johnson, 2100 South Harding St., Indianapolis, $4,573.

LUMBER—**Bedford, Ia.**—Taylor Co., 140,000 bd. ft. Class D, and 20,000 bd. ft. class A, rough Douglas fir bridge lumber, to Nebraska Bridge, Supply & Lumber Co., 448 Insurance Bldg., Omaha, Neb., $7,509. Bids July 20. Noted July 16 Daily.

PIPE, etc.—**St. Louis, Mo.**—Water Dpt., V. P. Roach, supt., 20,000 ft. 12 in. c.i. pipe at $1.171 per ft.•••2,100 ft. 20 in. c.i. pipe, to United States Pipe & Fdry. Co., Webb Crawford Bldg., Birmingham, Ala., $3.86 per ft.••• 2,000 ft. 8 in. c.i. pipe, to American C. I. Pipe Co., 2930 North 16th St., Birmingham, Ala., at 95c. per ft.•••hub and tapping valves, to M. & H. Valve & Fitting Co., Anniston, $4,100. Bids July 20.

TRACK MATERIALS—**New York, N. Y.**—Bd. Transportation, J. H. Delaney, ch., 250 Hudson St., to Bethlehem Steel Co., 25 Bway., special work $68,298; open hearth track rail, $256,444; rolled steel tie plates $57,308•••to Oliver Iron & Steel Co., 50 Church St., spikes $41,239••• to Rail Joint Co., 165 Bway., joint bars $39,744 •••to Republic Steel Corp., 60 East 42nd St., bolts, nuts, washers $17,986•••to Eastern Malleable Iron Co., Troy, $8,874. Grand total $489,893. Bids July 20. Noted July 5.

TURBINE PUMPS—**Rahway, N. J.**—State Dpt. Institutions & Agencies, Trenton, turbine pumps to W. Stothoss, Flemington Junction, $1,999. Bids July 26. Noted July 19.

†CEMENT—**Memphis, Tenn.**—U. S. Eng., 130,000 bbl. portland cement to Marquette Cement Co., U. P. Bldg., Memphis, $264,571. Bids June 28.

FOREIGN

Argentine, Buenos Aires—Aug. 20, by Argentine State Railway Administration, supplying 6,292 helical springs for railway bogies, couplings, buffers.

Egypt, Alexandria—Aug. 29, by Chairman of Egyptian Quarantine Bd., 1,500 meters of 60 cm. gage Decauville track consisting of 14 kg. rail on steel ties with all accessories, necessary for assemblies, 16 complete sets of points and crossings.

Union Socialist Soviet Republics — Soviet Government, Moscow, or c/o Amtorg Trading Corp., 201 5th Ave., New York, plans creating 6 new seaports on Arctic Ocean, incl. dredging, lighthouse, harbor work, docks, terminals. To exceed $2,000,000.

Union Socialist Soviet Republics—Railroad Trust Soviet Government, Government, c/o Amtorg Trading Corp., 261 5th Ave., New York, plans constructing new railway from Ufa to Magnitnaya, Ural Region. To exceed $5,000,000.

PUBLIC BUILDINGS

PROPOSED WORK

Calif., Long Beach—Long Beach Bd. Educ., plans by V. E. Siebert, 420 Security Bldg., repairs to John Dewey High School. P.W.A. allotted loan and grant. $125,000.

Calif., Long Beach—Long Beach Bd. Educ. plans repairs to James Russell Lowell School. P.W.A. allotted $125,000 loan and grant. E. L. Mayberry, 3900 East 3rd St., archt.

Calif., San Francisco—City and County of San Francisco, plans by Miller & Pflueger, 580 Market St., George Washington School, 3 story, rein.-con., 30th and Balboa Sts. Est. $750,000.

Calif., San Francisco—City and County of San Francisco, plans by M. J. Rist, Phelan Bldg., C. F. Strothoff, 2274 15th St., S. O'Brien, 2032 Baker St. and A. Schroepfer, 681 Market St., associated archts., Sunshine-Buena Vista School. $115,000 or more. P.W.A. funds and bond issue of 1933 financing project.

Calif., San Francisco—City and San Fra... Co., plans by Hyman & Appleton, 68 Po... and G. A. Lansburgh, 140 Montgomery ... school, Schwerin St., $175,000. Leland & ... 58 Sutter St., engrs.; plans by D. Reed ... cific Bldg. and E. J. Rogers, Phelan ... rein.-con. school, 30th Ave., $175,000. H. ... thal, 821 Market St., engr.

Calif., Santa Ana—City, plans by W. H. Austin and H. C. Wildman, Spurgin Bl... story, basement, city hall. Est. $105,000 ... voted $70,000 bond issue as security for ... P.W.A. allotted $105,000 loan and grant.

Calif., Santa Barbara—City plans el... Aug. 28, $320,000 bonds as security for ... ernment loan, for civic auditorium. Asso... Architects, 116 East Sola St., archts. ... Sept. 21.

†**Colo., Denver**—Treas. Dpt. at office ... Archt., Wash., D. C., plans mint buildi... dition, Colfax Ave. and Bannock St. $350...

†**Colo., Pueblo**—Treas. Dpt. at office ... Archt., Wash., D. C., plans altering and ... tions federal building 5th and Main ... $177,000.

Ga., Augusta—Augusta Canal Comm... A. Merry, chn., revising plans for hydro-el... plant to meet P.W.A. allotment and elim... contracting with private company to furnish stand-by power. New plan consists of ... hydro and auxiliary combustion engine p... Est. $1,250,000. Burns & McDonnell Eng. ... 107 West Linwood Blvd., Kansas City, Mo., engrs. Noted Feb. 22.

Ga., Reidsville—State Prison Comm... Judge E. L. Rainey, Atlanta, plans by T... H. Howell, Haverty Bldg., Atlanta, and ... takes bids 5 story, with two 2 story wi... 240x240 ft., H-shaped, main section admin... tration building; 2 story, 40x250 ft. ... building, incl. kitchen, storehouse and refrig... tor plant, laundry, bakery, dining rooms; 1 story, 60x80 ft. power house, 1 story, 80x100 ft. warehouse group, radial brick chimney, 2 dormitories, with three 2 story 42x242 ft. buildings, each; connecting corridors, 6x70 ft. long and 14 ft. wide, 2 stories; 4,000 ft. ... link fence 8 ft. high surrounding buildings with gates, two 80 ft. wells with 250 g.p.m.c., 50 ft. diam., 12 ft. high, rein... water reservoir; 100,000 gal. capacity elev... tank on 100 ft. tower. P.W.A. loan $1,500,000. Noted Apr. 12.

†**Ill., Galesburg**—Treas. Dpt. at office Sup. Archt., Wash., D. C., soon takes bids rein.-con., brick, stone post office, $192,000 appropriated by P.W.A. Aldrich & Aldrich, 700 Bondi Bldg., Galesburg, archts. Noted Mar. 9, 1933.

†**Ill., Moline**—Treas. Dpt. at office Sup. Archt., Wash., D. C., soon takes bids 2 story, basement, brick, stone, rein.-con. post office, $275,000 appropriated. W. H. Schulzke, 5th Ave. Bldg., Moline, archt. Noted Sept. 7.

†**Ill., Urbana**—Treas. Dpt. at office Sup. Archt., Wash., D. C., soon takes bids rein.-con., brick, steel post office. $80,000 appropriated.

Kan., Kansas City—City plans grain elevator 3,000,000 bu. capacity, and dock. Est. $2,000,000. P.W.A. approved $1,... loan and grant. Horner & Wyatt, 468 Bd. Tr... Bldg., Kansas City, Mo., engrs. Noted Nov. 30.

Kan., Olathe—State, plans by R. Coolidge, State House, Topeka, 3 story, basement, 65x288 ft., brick, stone, administration building and dormitory. Est. $185,000. Noted Dec. 21. **P.W.A.**

Mich., Allegan—City plans 2 story, basement, brick, rein.-con. and steel power plant, plain found. Est. $410,000. P.W.A. loan and grant approved. Injunction restraining city from proceeding with power plant project has been lifted. Ayres, Lewis, Norris & May, Cornwall Bldg., Ann Arbor, engrs.

Mich., Kalamazoo—Kalamazoo County, Bd. Supervs., plans by Le Roy & Newlander, Kalamazoo, 4 story, basement, steel, rein.-con. and brick and stone exterior, court house and jail. Est. $750,000. P.W.A. project. Noted Nov. 19, 1931.

†**Mo., Columbia**—Treas. Dpt. at office Sup. Archt., Wash., D. C., soon takes bids rein.-con., brick, stone post office, Cherry and 7th Sts. Noted Apr. 20, 1933.

†**Mo., Louisiana**—Treas. Dpt. at office Sup. Archt., Wash., D. C., soon takes bids remodeling and extending brick, concrete post office, $60,000 appropriated.

†**Mo., Windsor**—Treas. Dpt. at office Sup. Archt., Wash., D. C., rein.-con., brick, stone post office. $72,000 appropriated.

N. J., Belvidere—Bd. Educ., Belvidere Twp., election middle of August, for school, $122,000. **P.W.A.** Coffin & Coffin, 125 East 46th St., Newbury Park, archt.

N. J., Red Bank — Bd. Educ., High School, election in September, school, $280,000. **P.W.A.** E. A. Arend, 710 Mattison Ave., Asbury Park, archt. Noted Nov. 28 Daily.

O., Amherst—Municipality abandoned plans for municipal power plant. Closing contract with private power company for power. Noted Oct. 26.

O., Akron—City, plans municipal light plant. Reports nearing completion, will start plans in near future. Est. $3,000,000. Burns & McDonnell Engineers Co., 107 West Linwood Blvd., Kansas City, Mo., engrs. Noted Mar. 29.

†*Federal Government.*

Public Buildings (Continued)

O., Cincinnati—Zendigs, Panzer & Martin, archts., Southern Ohio Bank Bldg., rejected bids 3 story, basement, 120x125 ft., concrete, native stone museum, plain found., Eden Park, for Cincinnati Art Museum, c/o W. D. Siple, dir. **Noted June 28.**

Pa., Coraopolis—Municipality plans electric power plant. P. F. Loftus, Oliver Bldg., Pittsburgh, **engr.**

Pa., Pittsburgh—City, plans by Ingham & Boyd, Empire Bldg., brick and steel juvenile detention home. Est. $350,000.

Pa., Pittsburgh—University of Pittsburgh, plans by C. Z. Klauder, 1429 Walnut St., Phila., soon takes preliminary bids for "Stephen Collins Foster" Memorial Bldg. $500,000.

Tenn., Knoxville—City, plans by Barber & McMurry, General Bldg., part 1 and part 2 story school. $200,000.

Tenn., Knoxville—University of Tennessee, plans by Berber & McMurry, General Bldg., alterations and repairs to existing buildings.

Tenn., Knoxville—City, plans schools. P.W.A. granted $406,000 loan. R. F. Graf & Sons, Bauman & Bauman, 8334 Market St., and Barber & McMurry, General Bldg., archts.

Tenn., Nashville—City, plans fire hall and extensions. P.W.A. granted $150,000 loan. R. L. Lawrence, Jr., ch. engr. Waterworks.

Tenn., Nashville—City, plans school buildings. P.W.A. granted $2,000,000 loan for same. Marr & Holman, Stahlman Bldg., archts.

Tex., Dallas—Dallas Co., c/o R. J. Ogden, judge and City, c/o E. Goforth, secy., plans hospital improvements and addition, incl. operating room addition, psychopathic ward, addition to nurses home and additional wing to main building. Est. $291,000.

Wis., Marinette—Bd. Educ., A. W. Jackson, pres., sketches by Foller & Schoeber, 310 Pine St., Green Bay, rein.-con., brick, school. $120,000. Noted Apr. 5.

B. C., Vancouver—Dominion Govt., Ottawa, Ont., plans by J. Y. McCarter, Marine Bldg., public building at corner of Granville and Cordova Sts. $1,000,000. Noted Apr. 26.

BIDS ASKED

†Ala., Mobile—Aug. 21, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing single attendants quarters at Sand Island.

†Calif., Colton—Sept. 5, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $57,200.

Calif., Palo Alto—Aug. 16, by Trustees of Palo Alto High School Dist., reconstructing and repairing school, etc. B. M. Clark, 310 University Ave., archt. and W. L. Huber, 1 Montgomery St., San Francisco, engr. Noted May 24.

†Calif., Yosemite Park — Aug. 28, by National Park Service, Underwood Bldg., San Francisco, 1 and 2 story, 70x260 ft., rein.-con., hollow tile, utility building. $115,000.

†Fla., Plant City—Aug. 28, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $56,700. Adv. E.N.-R. Aug. 9. Noted June 5, 1933.

Fla., St. Augustine—Sept. 5, by City Comn., engineering services to be performed for City, to make surveys and reports sufficient and necessary to apprise the City Comn. and its Committee making study of electrical situation, as to what would be best for taxpayers and city, to do at or before the expiration of present franchise which is owned by Florida Power & Light Co.

†Fla., Winter Haven—Aug. 23, by Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office. Noted Dec. 14.

Ill., Clinton—Bd. Educ., taking bids 2 story, basement school. $105,000. **P.W.A.** Bergen & Kelley, Champaign, archts.

†Ill., Decatur—Aug. 16, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing, except elevator and dumbwaiter, U. S. Post Office. Noted Sept. 28.

†Ill., Decatur—Aug. 21, by Treas. Dpt. at office Sup. Archt., Wash., D. C., elevator and dumbwaiter at U. S. Post Office.

†Ill., Effingham—Aug. 23, by Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office. Noted Mar. 1.

†Ill., East Alton—Aug. 23, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $71,500. Noted Feb. 1.

†Ill., Fulton—Aug. 31, by Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office. $55,200. Noted Mar. 29.

Ill., Hinsdale—Village, R. S. Hopkins, comr. P. Wks., bids about Aug. 15, general contract 2 story, 50x110 ft., rein.-con., brick, police and fire station, $44,500 allotted by P.W.A. Bids July 27 rejected. H. Field, archt. Noted July 19.

†Ia., Clinton—Aug. 28, by Treas. Dpt. at office Sup. Archt., Wash., D. C., extending and remodeling U. S. Post Office. $91,155. Adv. E.N.-R. Aug. 9. Noted May 17.

†*Federal Government.*

†Ia., Independence—Aug. 30, by Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office. $57,800. Adv. E.N.-R. Aug. 9.

†Ia., Sac City—Aug. 30, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $42,800. Adv. E.N.-R. Aug. 9. Noted Mar. 9.

†Ia., Winterset—Aug. 21, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office.

Me., Augusta—Aug. 10, by State Dpt. Health and Welfare, Dr. H. C. Hanscom, Dir. State House, constructing heating and ventilating plants and systems in Sanborn Bldg. at State Hospital.

†Md., Beltsville—Aug. 24, by Con. Q.M., 2 story, basement, 62x102 ft., fruit products laboratory at Horticultural Farms. $100,000.

Mass., Boston—Aug. 22 by City, Trustees of Boston City Hospital, 11 story, basement, irregular sized, brick, steel, rein.-con. surgical and ward building, caisson found. $1,500,000. P.W.A. loan and grant. Jas. H. Ritchie & Associates, 100 Arlington St., archts.

†Mass., Boston—Aug. 31, by Treas. Dpt. at office Sup. Archt., Wash., D. C., changes in U. S. Post Office.

†Mass., Fairhaven—Aug. 24, by Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office. $68,800. Adv. E.N.-R. Aug. 9. Noted May 3.

†Mass., Turners Falls—Aug. 31, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $57,500. Adv. E.N.-R. Aug. 9. Noted Feb. 8.

Mass., West Springfield—Aug. 14, by McClintock & Craig, 458 Bridge St., Springfield, archts., 3 story, basement, 56x136 ft., brick school, concrete found., Park Ave., for Town. H. W. Eagan, chn. Bldg. Com. Est. exceeds $100,000. Noted Aug. 2.

†Mich., Hudson—Aug. 30, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $55,000. Adv. E.N.-R. Aug. 9.

†Minn., Hopkins—Aug. 29, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $58,000. Adv. E.N.-R. Aug. 9. Noted Feb. 2.

Mo., Kennett—Aug. 15, by City, P. C. Jones, mayor, brick, concrete, municipal power plant building, diesel engines, generators, switchboard, and other auxiliary equipment, and distribution system. $150,000. Burns & McDonnell Eng. Co., 107 West Linwood Blvd., Kansas City, engrs. Noted July 12.

Mo., Louisiana—Aug. 16, by School Bd., classroom and gymnasium addition to Central High School; remodeling Field School, Lincoln School and Central High School. $87,000 alloted by P.W.A. G. D. Barnett, Inc., Syndicate Trust Bldg., St. Louis, archts. Noted July 26.

†N. J., Hackettstown—Aug. 31, by Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office. $57,500. Noted Nov. 21, 1932.

†N. M., Silver City—Aug. 31, by Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office. $50,000. Noted Dec. 7.

†N. Y., Saugerties—Aug. 31, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $56,720. Adv. E.N.-R. Aug. 9.

N. Y., South Onondaga—Aug. 14, by Central School Bd., 2 story, basement, brick, steel, Central School. $150,000. Randall & Vedder, S.A. & K. Bldg., Syracuse, archts. **P.W.A.** Noted Apr. 26.

†N. Y., Warsaw—Aug. 28, by Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office. $44,175. Noted Dec. 8.

†N. C., Asheboro—Aug. 17, by Treas. Dpt. at office Sup. Archt., constructing U. S. Post Office.

†N. C., Pinehurst—Aug. 31, by Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office. $60,500.

†Okla., Bristow—Aug. 21, by Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office. Noted Mar. 8.

Okla., Clinton—Aug. 14, by School Bd., 2 story, basement, 78x116 ft. high school building, $160,000. W. T. Valberg, Oklahoma City, archt.

Ore., Klamath Falls—Aug. 20, by City Council, armory, $150,000. H. R. Perrin, Klamath Falls, archt.

†O., Bedford—Aug. 24, by Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office. $73,700.

†O., Berea—Aug. 28, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $46,800. Noted Apr. 26.

†O., Franklin—Aug. 30, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $57,400.

†O., Sebring—Aug. 30, by Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office. $47,700.

†Pa., Middletown—Aug. 31, by Treas. Dpt. at office Sup. Archt., Wash., D. C., U. S. Post Office. $51,025. Adv. E.N.-R. Aug. 9.

†S. C., Columbia—Aug. 22, by Building Committee Federal Land Bank, constructing office building and altering existing building, and extending elevators and dumbwaiters. Lafaye & LaFaye, Columbia, archts.

Tex., Brownsville—Aug. 14, by City, c/o R. B. Renfro, mayor, municipal improvements, incl. 2 steel forced draft stacks for boilers, steel truss, concrete deck roof over generating room at municipal power plant and extension plant, water pumping plant complete with 1 each of 12 in., 16 in. and 20 in. motor driven pumps with clutched drive to gasoline engine for 16 in. pump, concrete and galv. iron pump house, 3,400 ft. concrete lined canal and earth reservoir approximately 50,000 cu.yd. earth ex., cav., transmission line equipment, spray pond equipment, generator and boiler room instruments and equipment. H. E. Elrod, 316 Petroleum Bldg., Houston, engr., P.W.A. project. Noted June 14.

†Tex., Pecos—Aug. 28, by Treas. Dpt. at office Sup. Archt., Wash., D. C., elevator in U. S. Post Office.

†Va., Portsmouth—Aug. 22, by Yards & Docks, Navy Dpt., Wash., D. C., extending structural shop in Norfolk Navy Yard. $840,000.

†Wis., Portage—Aug. 24, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $51,200.

†Wis., West Bend—Aug. 17, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. Noted Sept. 27.

CONTRACTS AWARDED

Mass., Worcester—P. J. Keating, general contractor, heating and plumbing for 3 story, basement, 16x108 ft. fireproof balconies, to J. G. La Motte & Son, Inc., 21 Waldo St., Worcester; electrical work, to A. C. Senecal Co., P. O. Box 35, Westborough. Noted July 19, under "Contracts Awarded."

Minn., Minneapolis—State, Minnesota Soldiers Home, G. H. Davis, 107 State Capitol, St. Paul, 4 story, basement, 41x198 ft., rein.-con., brick, cut stone, hospital, at State Soldiers Home, by SERA labor. $225,000. G. L. Zoch, 478 St. Peter St., St. Paul, purchasing agent for SERA.

Mo., Gardenville — Kellermann Contg. Co., general contractor, 625 North Euclid Ave., St. Louis, miscellaneous iron and steel for 2 story, basement, brick, concrete school to Mechanics Iron Wks., 628 Edmund Ave., St. Louis, for Bayless Consolidated School Dist. **P.W.A.** Noted Aug. 2 under "Contracts Awarded."

N. H., Dover—Osgood Constr. Co., Nashua, general contractors, plumbing for 2 story, basement and tower, 72x158 ft. and 53x70 ft. city hall, to Sanborn, McDuffie Co., Rochester, $6,944; electrical work, to M. B. Foster Electric Co., 514 Atlantic Ave., Boston, Mass., $7,800, for City, F. C. Keefe, mayor. Noted July 26, under "Contracts Awarded."

N. J., Little Silver—Bd. Educ., general contract 2 story, basement, brick, school, to M. Riesz, Fords***heating and ventilating to F. Farrell, 629 Camden St., Newark***plumbing to W. O'Brien, Red Bank***electrical work to Terlizzi Bros., Bloomfield***steel to Breen Iron Wks., 272 Badger Ave., Newark. **P.W.A.** E. A. Arend, 710 Mattison Ave., Asbury Park, archt. Noted Apr. 26.

N. J., Skillman — Institutions & Agencies, State Office Bldg., Trenton, underground system at State Village for Epileptics to H. W. Porter, 825 Frelinghuysen Ave., Newark, $33,000; piping to G. J. Tobin, Plainfield, $2,247. Bids July 26. Noted July 19.

N. Y., Frewsburg—Bd. Educ., general contract 2 story, basement, brick, steel high school addition, to C. Shellberg, 32 Bush St., Jamestown, $16,500; plumbing to G. Schutt, North Main St., Jamestown, $2,373. **P.W.A.** Awarded July 27.

†N. Y., Malone—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office, to M. E. Ryan Co., 1545 Union St., Schenectady, $139,763. Bids May 29. Noted May 10.

N. Y., Mount Upton—Central School Bd., general contract school to F. W. O'Connell, 332 Water St., Binghamton; plumbing to C. W. Rishell, 131 Washington Ave., Endicott, est. $85,000. **P.W.A.** R. Freeburg, Jamestown, archt. Noted July 12.

N. Y., Saratoga Springs — Saratoga Springs Authority, general contract mineral water bottling plant to L. Keil, Ossining, $109,975. Former contractor withdrew. **P.W.A.** Noted May 10.

N. C., Elizabeth City—Pasquotank Bd. Educ., constructing school, to G. W. Kane, Greensboro, $39,000. Bids July 31. P.W.A. project.

N. C., Kannapolis—Cabarrus Co. Bd. Educ., general contract school, to J. J. McDevitt Co., Charlotte, $85,990***plumbing, to E. B. Grady, Kannapolis, $3,691***heating, to J. L. Powell, Bennettsville, S. C., $9,883. Grand total $99,564. P.W.A. project. Noted Jan. 25.

Okla., Chickasha—Bd. Educ., 2 story, basement, brick, steel high school, to W. F. Little, Amarillo, Tex., $177,318, est. $250,000. **P.W.A.** Bids July 14.

Constr. News page 59

Public Buildings (Continued)

Pa., Easton—J. L. Hanna, Dpt. Properties & Supplies, Harrisburg, 1 story, part basement, 60x164 ft., 45x60 ft., 60x66 ft. garage, to Berwick Lumber Co., Berwick, $53,344***electrical work, to C. M. Davis & Sons, 600 North 2nd St., Harrisburg, $3,075***plumbing, to R. Hetrick, 1935 State St., Harrisburg, $3,685*** heating, to Central Plumbing & Heating, Colonial Bldg., Allentown, $6,175. Grand total $63,204. Bids July 11, awarded July 30.

Que., Montreal — Secretary Dpt. P. Wks., Ottawa, Ont., constructing postal station in Notre Dame de Grace Ward, to L. G. Ogilve & Co. Ltd., Keefer Bldg., $98,390. Est. $136,000 Bids July 24.

COMMERCIAL BUILDINGS

PROPOSED WORK

Mass., Fall River—Merchants Mill, Inc., c/o E. Cote, 415 South Main St., plans by F. A. Rousseau, 78 Centre St., Fairhaven, 1 story, 90x560 ft., brick municipal market, concrete found., Pleasant St. To exceed $150,000.

Mich., Jackson—St. Stanislaus Parish, plans by A. Des Rosiers, 1418 Maccabees Bldg., Detroit, 2 story, basement, brick, rein.-con. convent, plain found., $105,000.

N. J., Hasbrouck Heights—Hasbrouck Heights Development Co., Central Ave., plans by H. Fritz, 625 Main Ave., Passaic, thirty 2 story, brick residences, $170,000.

N. Y., Brooklyn—Brooklyn Ridgewood Corp., L. E. Thompson, pres., 6th Ave. and 50th St., New York, bids late in fall, 2 story, theatre, 5th Ave., north of 50th St. $250,000. T. W. Lamb, 701 7th Ave., New York, archt. R.K.O. Theatre Corp., 1270 6th Ave., New York, lessee. Noted July 26.

N. Y., New York—F. P. Platt & Bro., archts., 221 West 57th St., bids after Oct. 15, altering, incl. plumbing and heating, stores and office building, 274 Bway., for Cleboume Realty Co., 610 Denver Natl. Bank Bldg., Denver, Colo., est. $30,000. Noted July 19.

N. Y., New York—West Side Savings Bank, 6th Ave. and 9th St., bids in October or later, altering heating and plumbing for 6 story apartment, 320 Manhattan Ave., $30,000 or more. F. P. Pratt & Bro., 221 West 57th St., archts. Noted July 19.

N. C., Raleigh—Seaboard Air Line Ry., E. C. Bazwell, genl. mgr., Norfolk, Va., plans new passenger station in northern part of city. To exceed $300,000. W. D. Faucette, ch. engr., Norfolk, Va.

Pa., Harmarville—H. H. Henderson, Gulf Bldg., Pittsburgh, soon lets contract one 1 story, two 3 story concrete laboratory buildings, $150,000. H. H. Henderson, Gulf Bldg., Pittsburgh, ch. engr.

BIDS ASKED

N. J., Roselle—St. Joseph Roman Catholic Church, E. G. Murphy, rector, 154 East 3rd Ave., bids about Aug. 15, rein.-con., limestone church, $200,000. F. F. Durang, 238 East 47th St., New York, archt.

N. Y., Brooklyn—See "Contracts Awarded."

N. Y., Massapequa—See "Contracts Awarded."

N. Y., New York — W. F. Weichbrodt, 34 Beekman Pl., bids about Sept. 1, altering elevator, boiler room, apartments, 32 Beekman Pl., $28,000. O. A. Studt, 45 West 52nd St., archt. Noted July 12.

Mass., Andover—Phillips Andover Academy, Andover, superstructure for 3 story, basement, 40x172 ft., brick, limestone infirmary, concrete found., Main St., to M. C. Tuttle, 31 St. James Ave., Boston. Total est. exceeds $105,000. Noted July 19.

Mass., Andover—Phillips Andover Academy, Andover, foundation and superstructure for 3 story, basement, 40x132 ft., brick, limestone dormitory, Main St., to M. C. Tuttle, 31 St. James Ave., Boston. Awarded July 25. Noted May 10.

N. Y., Brooklyn—G. Bernstein, 169 Duane St., altering two 4 story apartments, incl. heating, plumbing, Lafayette Ave., by separate contracts, $28,000. P. Markowitz, 5 Beekman St., New York, archt. Noted July 26.

N. Y., Brooklyn—M. Saxer, 891 East 14th St., altering 3 story, studio, stores, incl. chimney, heating, plumbing, by separate contracts, $28,000. S. Goldsmith, 589 Flatlands Ave., archt.

N. Y., Brooklyn—Drive Development Corp., B. Zintek, pres., 301 East 8th St., 6 story, apartments, 50 East 19th St., by separate contracts, $200,000. Seelig & Finkelstein, 153 Pierrepont St., archts.

N. Y., Brooklyn—H. Lefrak, 16 Court St., apartments, 4th Ave. and 81st St., by separate contracts, $150,000. Kavy & Kavovitt, 16 Court St., archts. Noted July 26.

N. Y., Brooklyn—S. Lipoff, 1935 66th St., 6 story, brick, 100x131 ft., apartments, Fort Hamilton Parkway and 85th St., by separate contracts, $200,000. Kavy & Kavovitt, 16 Court St., archts. Noted July 26.

N. Y., Massapequa—Roman-Breber Co., 134 West 32nd St., New York, constructing group of dwellings, Ocean and Pennsylvania Aves., by separate contracts. To exceed $100,000. Noted July 12.

N. Y., New York—W. S. Paley, 35 Beekman Pl., residence, 29 Beekman Pl., to Hegeman Harris Co., 360 Madison Ave., est. $100,000. Eldridge & Snyder, 101 Park Ave., archts.

N. Y., New York—Four Hundred Forty Nine East 84th Street Corp., I. Nichthouser, pres., 108 Clark Pl., plumbing and mechanical equipment, altering 5 story apartment, 449 East 84th St. by separate contracts, $28,000 or more. L. and L. Levy, 527 5th Ave., archts. Noted July 19.

N. Y., New York—J. Jemail, 40 Horatio St., plumbing, heating 5 story, basement, apartments, 421 Horatio St., by separate contracts, $28,000. S. B. Histadruth, 18 East 41st St., archt. Noted July 19.

N. Y., Rockville Center—Canterbury Realty Corp., 805 North Village St., group of dwellings, by separate contracts. To exceed $100,000.

O., Toledo—Secor Hotel Co., c/o T. De Witt, mgr., c/o Hollenden Hotel, Cleveland, hotel alterations, to A. Bentley & Sons, Belmont Ave., Cleveland, $50,000; incl. interior work, changing plumbing, heating, furnishings, decorations, dining rooms and kitchen equipment. Total est. $400,000. Walker & Weeks, 2341 Carnegie Ave., Cleveland, archts.

Wis., Wausau—St. Mary's Catholic Congregation, general contract 2 story, basement, 70x80 ft., brick, steel, school, to J. Lang, Wausau, $30,246***plumbing, to Central Plumbing & Heating Co., Wausau, $5,627 ***electrical work, to Snapp Electric Works, Wausau, $988. Grand total $39,204. Noted July 5.

INDUSTRIAL BUILDINGS

PROPOSED WORK

Fla., Pensacola — PLANT — Gulf Industries Inc., C. S. Barrett and T. Connbrook, Pensacola, in charge, revised plans by N. W. Corbett, archt. and engr., 130 West 42nd St., New York, shipbuilding plant, developing 180 acres. Est. $27,500,000. Maturity after Dec. 1. Noted May 11, 1933.

Me., Portland — BULK PLANT — Colonial Beacon Oil Co., 30 Beacham St., Everett, Mass., soon takes bids bulk plant, incl. tanks, pipe lines, roadways, etc. To exceed $40,000. Private plans.

Md., Baltimore—SUBSTATION—Gas & Electric Co., Lexington Bldg., plans 2 story, 60x80 ft. electric substation. Est. $50,000. A. D. Loizeaux, Monument and Constitution Sts., engrs.

Mich., Detroit — PLANT ADDITION — Superior Tool Wks., 6633 Rohns St., plans by Pollman, Ropes & Lundy, 2539 Woodward St., plant addition. Est. about $28,500.

Mich., Trenton—WAREHOUSE—Trenton Valley Distillers Corp., H. Low, genl. mgr., Trenton, purchased site and plans by G. F. Diehl, 120 Madison Ave., Detroit, 2 story, rein.-con., brick, steel warehouse, plain found.

Mo., St. Louis—LAUNDRY—Mungers' Linen Clover Leaf Towel Supply Co., c/o L. Moscovitz, 5515 Easton Ave., altering and constructing 1 story, basement, 100x160 ft., brick, steel, laundry, 5515-19 Easton Ave. B. Shapiro, Wainwright Bldg., archt.

N. Y., Brooklyn — SERVICE, REPAIR GARAGE—Karron & Leiberman, 712 New Jersey Ave., bids after November 1, general and separate contracts. McDonald and South 20th Ave. $40,000 or more. C. Goodman, 375 Fulton St., archt. Noted July 26.

Pa., Allentown—GARAGE—Traylor Hotel, 1436 Hamilton St., plans by G. Yundt, 426 Hamilton St., 1 story, 32x140 ft. brick, rein.-con., steel garage, plain found., Hamilton St. Est. $30,000.

Pa., Altoona — PLANT — Puritan Knitting Mills, A and Indiana Aves., Phila., purchased industrial building and remodel same into modern textile plant, install new machinery, equipment, etc. Est. $50,000 or more.

B. C., Nelson—MILL—O. D. Frith, mgr. Goodenough and Jmir Mines Ltd., plan purchasing 100 ton mill and constructing tramway 1½ mi. from Jmir and 3,000 ft. from Goodenough.

Man., Winnipeg—MILL—P. H. Fay, of Scoran Securities, plans to purchase 100 ton cyanide mill for Diana Gold Mines Ltd.

†Ont., Almonte — REFINERY — H. Gordon Hughes, archt., preparing plans new refinery, $200,000.

Ont., Michipicoten (Wawa P. O.)—PLANT—Clare Canfield, mgr., Vansickle Mine, plans to develop new property and equip a plant and buildings at Deep Lake where gold has been discovered, $35,000, also install electrical equipment.

Ont., South Porcupine—MINE STRUCTURES etc.—Two-in-One Gold Mines Ltd., c/o A. D. Cochrane, South Porcupine, plans mine structures and gold mining development. To exceed $500,000 with equipment.

Ont., Toronto—PLANT—Canadian Boat Industries Ltd., R. H. Saunders, pres., plans plant, $40,000.

Ont., Toronto — PLANT — Liquid Carbonic Canadian Corp., 41 Mill St., plans rein.-con. plant for manufacture of liquid carbon dioxide and dry ice, Mill St., $150,000-$200,000. Engineer and architect not appointed.

Que., Montreal — PLANT — International Bronze Powders Ltd., H. W. Jackson, pres., plans extensive operations and developments, $1,000,000.

BIDS ASKED

Fla., Miami Beach—SERVICE STATIONS etc —See "Contracts Awarded."

Ind., Columbus—FACTORY—Cummins-Diesel Engine Co. taking bids 1 story, 85x250 ft. brick, steel factory at East 5th St. $36,500. Private plans.

Mich., Detroit—STOCK HOUSE—Stroh Brewing Co., Gratiot Ave., taking bids 5 story, basement, and sub-basement, 120x130 ft., steel, brick, rein.-con. floor and beam and slab stock house, plain found., Gratiot Ave. Harley & Ellington, 1507 Stroh Bldg., archts. and engrs. Noted July 19.

N. J., Phillipsburg—BOILER PLANT—J. T. Baker Chemical Co., Phillipsburg, taking bids boiler plant, $50,000. J. G. Berger, 24 Commerce St., Newark, engr.

N. Y., New York — FACTORY — Lama & Proskauer, archts., 383 Jay St., Brooklyn, taking bids factory and garage, 617 East 18th St., for J. U. Breckman, 165 Bway., est. $28,000. Noted July 19.

CONTRACTS AWARDED

Calif., Corning—CANNING PLANT—Corning Olive Grower's Assn., H. K. Shirk, mgr., 1 story, 89x185 ft., wood frame, corrugated iron canning plant, to F. H. Neilson, 96 8th St., Orland, at cost plus. Awarded July 27.

Ind., Fort Branch—PLANT—Emge & Son, Fort Branch, remodeling packing plant additions, to Scharborough & Co., Evansville, est. $36,000. H. P. Henshein, 59 East Van Buren St., Chicago, Ill., engrs.

Md., Baltimore — DAIRY PLANT — Wilton Farm Dairy, Wilkens Ave. and Maiden Choice Lane, 2 story, 50x70 ft., dairy, incl. electric wiring and equipment, to C. L. Stockhausen Co., Gay and Water Sts., $35,000. Bids May 14, awarded July 26. Noted May 31.

Md., Highlandtown (Ind. sta. Baltimore)—SHED—L. R. White, Jr., archt., 10 West Chase St., Baltimore, 1 story, 132x160 ft. scrap cork shed, concrete found. on conc. piles, steel frame, to E. Eyring Sons Co., 808 South Conkling St., Baltimore, for Crown Cork & Seal Co., Highlandtown. Awarded July 31. Noted Aug. 2.

Mass., South Boston (sta. Boston)—PLANT—White Fuel Co., A. Birmingham, mgr., 388 East 1st St., extension of pile and timber wharf, to R. B. Rendle & Co., Inc., 364 Border St., East Boston. Owners taking bids constructing conveyor trestle, furnishing belt conveying machinery and rebuilding hoisting tower. G. P. Carver, 27 River St., Beverly, engr. Noted June 7.

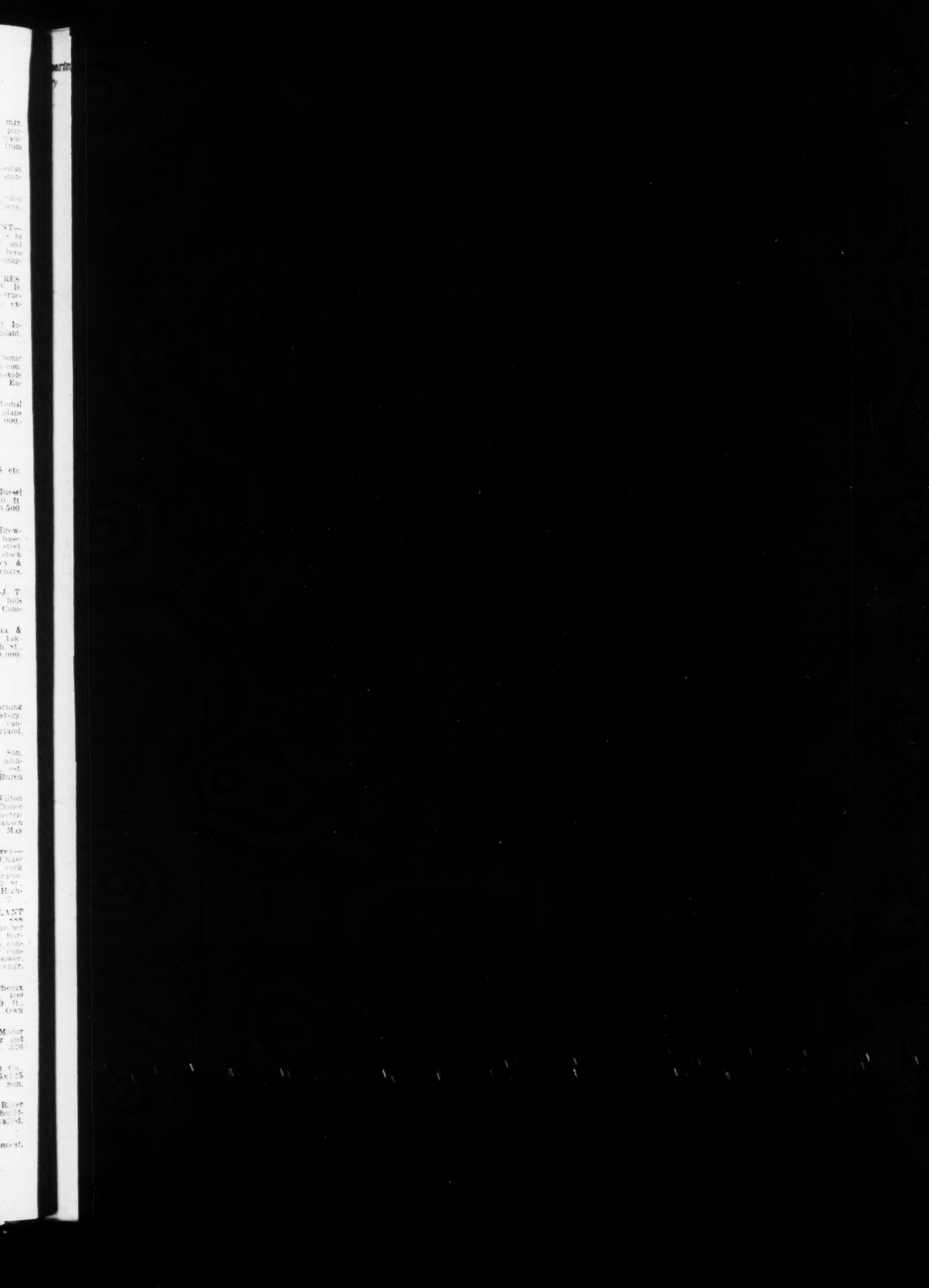
Tex., Victoria — FACTORY — Kraft-Phenix Cheese Corp., c/o C. H. Kraft, vice-pres., 400 Rush St., Chicago, Ill., 2 story, 60x120 ft., brick, concrete cheese plant, plain found. Own forces. Private plans.

Wis., Janesville—FOUNDRY—Chevrolet Motor Co., Janesville, general contract remodeling and foundry building addition, to T. S. Willis, 326 Hayes Bldg., Janesville, awarded July 27.

Wis., Fontana—FACTORY—Palmer Boat Co., D. Campbell, mgr., Delavan, 1 story, 75x125 ft., brick, rein.-con., factory to Piehl & Son, Delavan. Awarded July 24.

B. C., Powell River—PLANT—Powell River Co. Ltd., 3 story, 68x49x85 ft., rein.-con. building at plant, also 4 Olives filters to be installed, owner builds. Noted Dec. 5.

Constr. News page 60

For official proposal advertising see Searchlight Section

†Federal Government.